

**Canada's
Forest
Industry**

the next twenty years: prospects & priorities

**Strategic
Analysis**

SIMONS

**Woodbridge, Reed
& Associates**

Canada's Forest Industry

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Strategic Analysis

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PREFACE TO VOLUME I

This study of the Canadian Forest Products Sector was commissioned by the Canadian Forestry Service. Its purpose is to assess the sector's development potential. The study evaluates the demand outlook for existing and potential forest products, the current and potential competitive position of the various sub-sectors of the industry in Canada and the available resources.

The full report on this study comprises six volumes. The contents of the full report are as follows:

Volume I	Strategic Analysis
Volume II	World Demand - Supply
Volume III	Pulp and Paper
Volume IV	Wood Products
Volume V	Fibre Assumptions
Volume VI	Cost Projections

The first section of Volume I presents brief highlights of the total study. The remainder of the Volume is devoted to a strategic analysis of the prospects and priorities for the Canadian Forest Products Industry to the Year 2010.



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We would like to express our appreciation to the Canadian Forestry Service (CFS) for providing to us the opportunity to carry out this study. In particular, we would like to mention three people who have been involved from its inception to final publication. They are: Mr. Warren Calow, Director General, Industry, Trade Technology Directorate; Mr. Fred Johnson, Director, Industry Branch; and Mr. Doug Ketcheson, Director, Economics Branch. Their guidance and advice, and the value of their experience, were very much appreciated throughout preparation of the study. We take this opportunity to acknowledge the key role they played in its design and in the overall vision of a strategic study for the sector.

Decisions on the contents of the study, and the responsibility for the conclusions, nevertheless rest with the authors and not the Canadian Forestry Service or its individual members.

In addition, during the preparation of Volume II (Demand and Supply Assumptions), we were pleased to have the opportunity to work with an Industry Advisory Group in the development of realistic assumptions of longer term trends relating to global demand and supply to the Year 2010. This group represented a broad cross-section of the Canadian manufacturing industry, including representatives of the wood products, pulp and paper and research sectors and trade associations.

We would very much like to acknowledge the valuable contribution of this group during the preparation of Volume II. Members of the Industry Advisory Group were: Mr. Mike Apsey, President, Council of Forest Industries of BC; Mr. J.H. Rogers, Pulp and Paper Research Institute of Canada; Mr. David Wilson, Canadian Pulp and Paper Association; Mr. Dan Alexander, President and CEO, St. Mary's Paper Inc.; Mr. Michel Rolland, Director, Corporate Planning, Rolland Paper Inc.; Mr. Bill Hughes, Executive Vice-President, Pulp and Paper Manufacturing, Prince George Pulp and Paper Ltd.; Mr. Tony Rumbold, Maritime Lumber Bureau; Mr. Gaston Mallette, President, Waferboard Corporation; and Mr. Ross Hay-Roe, President, PaperTree Economics Ltd. Again, we should add that the final responsibility for the analysis, data and forecasts rests with the authors and not the Group or its individual members.

Volume VI of the study (Prospects for Canadian Cost Competitiveness) was prepared jointly with Price Waterhouse and we would like to acknowledge with thanks their association with us in its preparation.

Finally, the authors also would like to acknowledge the hard work and dedication of Woodbridge, Reed and Associates and H.A. Simons secretarial and support staff in Vancouver, Toronto, Montreal and Atlanta for all their seemingly endless efforts in word processing and the preparation of graphics.

Woodbridge, Reed and Associates
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REPORT HIGHLIGHTS

- * Canada's forest industry is poised on the brink of a new era. Over the next 20 years, the industry has excellent prospects for profitable, export-led growth, in a wide range of higher value products.
- * Globally, the forest products industry is healthy and expanding. Worldwide expansion in consumption reinforces Canada's role as the world's largest exporter of forest products. But increased globalization has forced major changes in Canada's traditional role as a supplier.
- * Competition from other suppliers, and from alternative products, has led to significant restructuring within the Canadian forest industry over the past five years or so. This is still taking place today. Important gains in productivity have been achieved. Record expenditures on new plant and equipment are being undertaken.
- * The Canadian industry has responded well to the expanded competition. Within some sectors, such as Canada's aging kraft pulp mills, much more needs to be done. Nevertheless, Canada's industrial capacity in forest products today is much more cost and quality competitive than it was just a few years ago.
- * Higher value-added production is being attained, albeit slowly. The opportunities are fairly clear to the industry, which has a much more focussed vision of its path to future excellence than it had at any time in the recent past.
- * Full achievement of Canada's potential in value-added opportunities, however, will require major commitments of additional capital. There are risks involved. While Canada's investment climate now favours its current product mix, a significant improvement in this climate will be needed if the country's full capability is to be exploited.

- * Investment climate refers to creating the conditions which will induce new investment to be made in Canada's forest products industries in preference to elsewhere in the world. It goes beyond takeovers and mergers which primarily involve ownership changes. In the widest sense, it is concerned with furthering resource development in Canada and the creation of new or improved manufacturing capacity to meet new market challenges.
- * Changes also will be required in management's attitudes to innovation and risk taking. For the most part, it is a conservative industry which excels in well established technologies. It is not readily adaptable to entrepreneurial initiatives, but this is precisely where Canada's major opportunities lie and where its unique strengths can be fully exploited.
- * Canada is highly dependent on public timber and, as a major forest products exporter, is unique within the world in this respect. The provinces have an important partnership role as the landlords of Canada's commercial timber. Over a long period of time, their policies have been supportive and progressive. They have moved increasingly to higher standards of utilization. Nevertheless, the days are over when Canada had available large, underutilized tracts of low cost timber. Moreover, there are growing environmental concerns. Correspondingly, provincial resource policies will become increasingly influential in determining the pace and direction of the industry's future growth.
- * This shift in Canada's timber resource position and outlook is occurring at the same time as external forces are bringing about increased competition from the US and offshore and from new products. Ironically, these influences may well turn out to be very beneficial to Canada, by providing a further stimulus to positive change, at a time when companies are receptive to new approaches and challenges.
- * One of the major conclusions of the study is that Canada's impressive export-led performance to date can be attributed to three engines of growth. These engines are respectively:
 - the rapid growth in US demand for Canadian construction grade softwood lumber used extensively in the housing industry;

- . exports of softwood bleached kraft market pulps to the world's paper makers;
 - . exports of standard grade newsprint for the world's newspaper publishers.
- * There is little doubt that these three major commodity products will remain as the backbone of the industry's exports.
 - * The study concludes, however, that two of the three engines are losing their thrust, in the sense of being able to give a further significant boost to the industry's future growth. They are Canada's commodity grade lumber sector and its softwood kraft market pulp sector, both of which are slowing down.
 - * Canada's softwood lumber sector is a model of efficiency, comprising a large number of low unit cost, economy of scale mills producing sizeable volumes of standardized, commodity grade product.
 - * Nevertheless, construction grade softwood lumber demand in the US is maturing and little real growth is expected, relative to the rapid growth rates of the past. Moreover, lumber prices have been declining for some time and sawmills are under increasing cost and margin pressures. There are few prospects of major expansion in exports of construction grade lumber to offshore markets which would offset US market maturity in this grade.
 - * The scope for efficiencies and productivity gains in low value-added grades has largely been realized. Significant future progress can be achieved only by capturing more value from the resource. Although this is beginning to happen, it is occurring slowly. Sorting for grade and the production of engineered wood products, components and so on are some examples. While opportunities are readily evident, substantial new capital injections will be required in many cases.
 - * In reconstituted boards, new products such as oriented strand board (OSB) and medium density fibreboard (MDF) have provided growth opportunities recently. They have expanded the panelboard sector's capability well beyond its traditional staple product, softwood plywood, and a small volume of hardwood plywoods produced mainly for the domestic market.

- * Despite these progressive developments, cash flows from existing operations in the solid wood products sector may not be sufficient to finance the necessary changes. Correspondingly, a period of restructuring and a movement to larger, more integrated sawmilling groups, in better overall balance with their fibre resources and uses, appears to be in prospect.
- * The outlook is mixed also for Canada's kraft market pulp sector. New, strong competition has emerged externally from new suppliers such as Brazil in high quality eucalyptus and from other low cost suppliers such as Chile, in softwood bleached kraft pulps. More of this type of competition can be expected; much of it based on low cost, fast growth plantation timber.
- * In addition, technological changes (e.g. growth in bleached CTMP) and market preferences (e.g. towards the use of hardwood fibres in printing papers) have also toppled northern softwood kraft market pulps from their traditionally exclusive, pre-eminent position. They are still a vital part of the papermaking economy, but only the low cost suppliers and highly efficient mills can afford to remain in the market pulp business.
- * Canada has a number of highly efficient, low cost mills producing softwood or hardwood fully bleached kraft market pulps. For them, the near term outlook is excellent. Many of Canada's aging, increasingly higher cost, inefficient kraft market pulp mills, however, face an uncertain future. Much of this uncertainty can be attributed directly to the huge cost of bringing these mills up to competitive world standards.
- * The strategic choices open to these mills include:
 - . major capital expenditures in order to become fully cost and quality competitive as market pulp mills, as well as efficient in resource use and acceptable in terms of new, much tougher environmental regulations;
 - . even greater capital expenditures to move into integrated production of paper and/or paperboard;
 - . severe rationalization or closure of existing operations and a change to a modified or different technological base on the same site or;
 - . in a few instances, closure of existing operations in favour of new sites.

- * If the problems facing Canada's kraft market pulp sector can be overcome, it will provide an excellent base for future expansion in higher value papers and paperboards, as well as in converting industries. Potentially, therefore, this is a significant future engine of growth.
- * Some progress already has been made, in a few cases, in forward integration of kraft market pulp mills into woodfree and wood-containing printing papers. Technical and market conditions are conducive to capturing extra value, provided that crucial environmental and financial issues can be resolved.
- * Canada's newsprint sector stands out the clear winner as a future engine of growth. An increasing number of companies in the newsprint sector now have manufacturing capacity in a much larger "family" of mechanical pulp based grades and power-intensive technologies than previously.
- * The sector has outgrown its traditional association solely with newsprint. A more accurate description would be the mechanical printing papers sector.
- * Standard grade newsprint for newspaper publishers is the staple commodity in this sector. Global demand for this grade is growing more slowly than it was some decades ago. Nevertheless, advances in process technology have provided much greater flexibility in the use of alternative, low cost furnishes and have given a sharp boost to newsprint's competitiveness during the 1980s compared with TV, radio and other advertising media.
- * In addition, newsprint quality has improved progressively and this grade has become sharply differentiated, with an elite group of high quality producers setting the overall pace.
- * New developments in printing technologies and the printer's growing need for improved surface qualities have created demand for a much wider variety of printing and publication papers. New end-use applications have provided a broader range of markets for the wider family of mechanical pulp based printing and publication grades than existed even five years ago.

- * Correspondingly, further significant growth prospects await the sector in:
 - . higher value mechanical pulp based paper grades including uncoated mechanical, catalogue and advertising papers;
 - . coated publication grades such as lightweight coated papers (LWC);
 - . other coated mechanical printing grades which will compete with the more expensive woodfree grades;
 - . various mixed furnish specialty grades which involve small volumes initially but which frequently can grow in significance over time.
- * In this regard, Canada has its sights on a major prize -- the large and expanding US market for printing and writing paper. Increasingly, the historical distinctions between paper grades, defined in terms of the raw materials used, is irrelevant to the buyers. Provided that end-use performance requirements are met, producers such as Canada have a great deal of freedom to be innovative. Moreover, there are other opportunities, such as in a wide variety of paperboard grades, where Canada's unique strengths can be exploited.
- * Over the short to medium term, the current rapid build-up of newsprint and other mechanical pulp based papers capacity to meet these growth markets will overlap with older, frequently less competitive, capacity in standard grade newsprint and lower valued printing papers. Excess capacity will have an adverse effect on product prices throughout the sector because of substitution between grades. Nevertheless, globally and in Canada, a much healthier mechanical pulp based printing papers sector is likely to emerge.
- * The struggle between producers for strategic positioning and quality leadership in this sector is likely to remain focussed on major consuming areas such as Europe and North America. Process and product innovations initiated in Europe and Japan now are finding ready applications, and are being improved upon, in North America. The power intensive nature of these technologies, coupled with other supporting factors, capitalizes on Canada's major competitive strengths. Continued new investment in this sector is likely despite the prospect that product prices will soften over the short term.

- * Canada's response to the challenges of product innovation is the key to its future growth and to the overall health of the increasingly inter-dependent forest products sectors. Traditionally, Canada's industry has focussed on production and process technology. In future, the product innovators will be the winners.
- * Our projections indicate that, for Canada as a whole, the value of the forest product industry's output, valued at the mill gate, will expand from an estimated \$26.7 billion in 1987 to \$33.4 billion by 1995 and \$41.5 billion by the Year 2010, expressed in 1987 dollars. This is based on conservative projections of global demand: very likely, it could be much higher. Even so, it represents a 55% increase in real output value over the 20-year period.
- * Canada's pulp and paper sector accounted for an estimated 70% of this total output value in 1987, compared with 30% for wood products. We project that both of these major sectors will increase in absolute importance because of:
 - . volume expansions;
 - . an upward shift towards a higher value product mix.
- * Growth in the pulp and paper sector, however, will be more robust, as this is where many of the strongest components for Canada's future engines of growth exist. By the Year 2010, pulp and paper will account for around 76% of the forest industry's expanded output value. Moreover, the two major sectors will become increasingly integrated over this period.
- * Today, Quebec ranks highest of all regions in Canada in terms of the value of its forest products output. It is very heavily orientated to pulp and paper compared with wood products. British Columbia, which historically has been much more committed to wood products, is second; followed by Ontario, the Atlantic Provinces and the Prairies.

- * Fibre supply constraints, combined with an initial loss of newsprint capacity as old, uneconomic machines are closed during the 1987-1995 period, will constrain growth in Quebec's output value over the medium term. Nevertheless, the process of rationalization of existing newsprint, and some high cost market pulp capacity, in Quebec is an essential precursor to subsequent accelerated expansion in higher value added grades of paper and paperboard. Quebec has excellent prospects for strong growth in freesheet papers as well as significant growth in mechanical printing papers.
- * British Columbia's prospects for expansion also are very good, although its circumstances are less amenable than Quebec's to a sharp increase in higher value grades. By the mid 1990s, BC is likely to surpass Quebec in terms of the total value of its forest products output. Most of the incremental growth will be in newsprint and a variety of publication grade papers (e.g. LWC) expansion on the Coast. Expansion in these grades in the Interior will be stronger in the subsequent 1995-2010 period, than earlier. Market and affiliated pulp capacity is projected to decline on the Coast as much of the marginal pulp capacity becomes partially or fully integrated and converted. Market pulp capacity in the Interior is likely to expand strongly, particularly prior to 1995, with much slower growth subsequently as wood costs rise to average, international levels.
- * Ontario is well placed to upgrade a substantial portion of its uneconomic newsprint capacity. Market mechanical pulp capacity has scope to expand quickly in the short to medium term, but to become integrated into paper or board fairly soon afterwards. The same is projected for hardwood chemical pulp, but a decline is expected in machine dried softwood kraft pulp shipments.
- * Ontario, like Quebec, is well located to penetrate into markets in the US, such as the US Midwest and Northeast, and capture significant new investment. This assumes that the investment climate in Ontario is conducive to these developments and that the apparent fibre surplus (mainly hardwoods) is realistic.

- * The Atlantic Provinces are likely to see reasonable growth in newsprint, to full state-of-the-art, or elite machines, plus expansion in integrated mechanical and freesheet papers. Over the longer term, there are good prospects for an expansion of market and affiliated kraft pulps, based on moderate to fairly high cost but good quality underutilized mixed hardwood/softwood stands.
- * The Prairies are likely to continue with the current exceptional growth in capacity for the immediate future. Specifically, Alberta's aggressive programs to develop a strong papermaking base over the short term, through rapid expansion mainly in aspen and aspen-softwood pulpmaking, are likely to more than double the region's value of output over the period from 1987 to 1995. Part of this capacity expansion already has been announced, or is underway. Alberta's rapid expansion in pulp capacity will flow through to integrated papermaking, in part, notably between 1995 and the Year 2010. Alberta's market pulp, however, will continue to be very competitive and is likely to remain as the backbone of the province's pulp and paper sector for some time to come.
- * For Western Canada in general, the recent shift towards greater dependence on the pulp and paper sector will continue. Moreover, prospects in Pacific Rim markets are likely to grow at a faster rate than those in the US.
- * The basic conclusion with respect to wood products is that, with the exception of the BC Coast, there is little regional variation across Canada; the issues highlighted earlier with respect to the vulnerability of much of the country's commodity grade lumber production (and the desirability of adding value) have general application. However, in British Columbia the plywood industry faces a special challenge to maintain its current level of activity through modernization and reduced production costs. Additionally, there is some opportunity for specialty plywoods, based on the remaining high quality coastal fibre.

- * There is little doubt that Canada is well placed to benefit from future growth opportunities in global forest products trade. Many of the structural changes taking place in the industry worldwide are to its advantage. Even where they may present a disadvantage to some of its traditional products, or to some traditional manufacturing processes, they can be offset through better development of alternative process technologies, managerial resources and/or the application of entrepreneurial spirit. Of particular importance will be the relationship between the provinces, as landlords of most of Canada's commercial timberland, and the private sector manufacturing companies.
- * Forest products is a growth business. It is also a business in which process and product technologies are changing rapidly. Canada is well placed to respond to these changes and to meeting future opportunities for expansion. Canada has some of the best forest resources in the world. It is located next to one of the largest, growing and net importing market areas in the world, the US. On the basis of our market analyses we conclude, with confidence, that the future is not constrained by lack of market opportunities.
- * Nor do we believe that apparently limited forest resources in Canada will be the major constraint to growth over the next twenty years. Moreover, the impact of accelerated harvesting of overstocked, diseased and damaged trees will give a boost to supply over the foreseeable future ("the AAC effect"). Action needs to be taken now, however, to avoid a subsequent falldown effect and to make best use of Canada's productive forest-land.
- * Additional supply, from the existing base, is likely to emerge through a combination of higher timber prices and better utilization.
- * In the 21st Century, Canada's forest industry clearly will no longer enjoy the unique position in world trade that it had historically. The days of being one of a few major export suppliers are past. Gone also are the days when a country such as Canada could simply take a passive role as a supplier, focussing only on production, and the achievement of low unit costs of production, to ensure its competitiveness.

- * The increasingly competitive conditions which will prevail, and the regional specialization which will occur under liberalized trade globally, are very much in favour of Canada's resource position and manufacturing capability. They will reinforce many of Canada's very progressive policies on resource development. They will support an aggressive shift towards forward integration and higher value-added. Most importantly, they will allow the forest products manufacturing industry to capitalize on its competitive strengths and exploit more fully the process and product technologies in which Canada can achieve excellence.
- * Even though the future is not constrained by the lack of opportunities, making use of these opportunities will require much more enlightened policies and coordination between the various segments of the industry. The objective will be to achieve a mutual vision in the pursuit of strategies for healthy, balanced growth in Canada's forest industry. The key resource of tomorrow will be effective and innovative management, both in the public as well as the private sector. We conclude that all forest industry players have to continue with the current shift from mainly production-orientated to predominantly marketing focussed management.
- * As landlords of most of Canada's commercial timber, the provinces play an integral, and increasingly influential role, in determining the shape and form of the sector's future growth. Credit should be given to the provinces for progressive policies towards improved utilization. Nevertheless, in view of the magnitude of future export market opportunities for the industry, the provinces must expand their vision of the potential. Specifically, provincial policies to facilitate major private sector investment, based on what essentially is a publicly owned forest land resource, require that the investment climate must remain healthy and competitive with alternatives throughout the world.
- * Ultimately, the magnitude and form of capital investment in the manufacturing industries will be the acid test of whether or not Canada's forest industry will achieve its full potential over the next twenty years.

SECTION 1.0
INTRODUCTION

- 1.1 PURPOSE OF THE STUDY
- 1.2 STUDY APPROACH
- 1.3 PAST AND CURRENT ENGINES OF GROWTH
IN THE SECTOR
- 1.4 FUTURE ENGINES OF GROWTH
- 1.5 SUMMARY OF GROWTH PROSPECTS TO 2010
- 1.6 FORMAT OF THE VOLUME I ANALYSIS

1.1 PURPOSE OF THE STUDY

The forest industry is an important part of Canada's economy and its culture. Canada is the world's largest single exporter of forest products and the country accounts for nearly one in every four dollars earned from forest products exports in global trade. The future of this vital sector is important to Canadians, to Canada's customers, and to those who are involved directly and indirectly in the industry and its related sectors.

In recent years, the industry has experienced dramatic swings in its fortunes. Lately, it has been enjoying a spectacular level of success. Not long ago, the opposite was true. Between the early to mid 1980s, most of Canada's forest industry went through a traumatic period of low product prices and very tough competitive conditions. This was aggravated by the high cost of debt servicing incurred as a result of investments, mergers and takeovers in the 1978-1982 period.

Moreover, significant structural changes continue to occur in the forest products industry worldwide. Despite the current prosperity of most of Canada's forest products companies, few people in the industry are unaware of the dramatic shifts that are occurring in its global competitive position. While many of the elements of change are external to Canada, such as the emergence of new low cost suppliers, others are the result of policies and decisions made within Canada.

This study was initiated and commissioned by the Canadian Forestry Service, Government of Canada, to provide a basis for discussion of these issues. More specifically, the purpose of the study is to assess the development potential for the sector from the perspective of Canada's 'market driven' opportunities in forest products to the Year 2010.

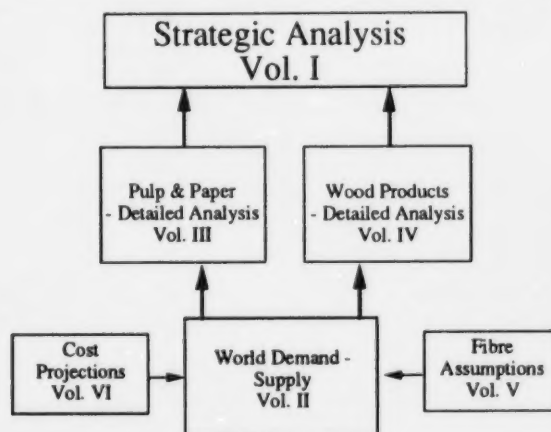
The study contains many analyses, predictions and assessments of the best paths by which Canada can achieve its potential in forest products. Nevertheless, the focus throughout the study is on the development of a credible scenario of opportunity, rather than trying to provide a 'blueprint' for successful growth. Within the perspective of global market opportunities and competitive developments, the study sets out to assess how Canada's forest industry is likely to perform. Correspondingly, it attempts to identify areas where any existing or prospective constraints to desired levels of growth can be overcome.

1.2 STUDY APPROACH

Our approach to the study is illustrated in Figure 1-1. Each of the six major components is the subject of a separate volume. Volume I provides a strategic assessment of the prospects and priorities for Canada's forest industry over the next twenty years in a global perspective. It pulls together, in a single volume, the major findings and implications of the technical volumes (Volumes II-VI). Furthermore, it knits together the various 'strands' of product and sector analyses into an overall 'fabric' for Canada and its regions. Importantly, it is the major volume for assessing the overall outlook for the industry and discussing the policy issues which face it over the coming years.

Volume II is one of the building blocks for the study. It presents our assumptions about consumption trends and production patterns and gives detailed projections of the global demand and supply outlook for the industry over the shorter and longer term (to the year 2010). Global fibre supply assumptions are provided.

Figure 1-1
Schematic of Inter-relationship Between Study Volumes



Volumes III and IV examine the outlook product by product, region by region. Volume III deals with market pulp and all paper and paperboard grades. Wood products are the focus of Volume IV. Both provide in-depth analyses of consumption trends, existing and future capacity projections, discussion of competitive position and forecasts of Canada's prospects in existing and new growth products.

Volume V provides our assumptions regarding future fibre supply in Canada. Volume VI, carried out jointly with Price Waterhouse, examines comparative costs of pulp and paper manufacturing and forecasts trends in costs, by major producing regions, to the year 2010.

The evaluation of 'market driven' opportunities was the first step in carrying out this study. In recent years, a large number of quantified forecasts and projections have been produced with regard to demand and supply expectations. These include public studies, such as FAO/Chase and ETTS IV, as well as numerous private sector assessments. The common element of these projections is that they look at the future: however, they differ to varying degrees in most other respects. Some are regional. Others are global, but often they differ from others of the same type in basic assumptions, methodology and/or scope.

In this study "Canada's Forest Industry. The Next Twenty Years: Prospects & Priorities" a global demand and supply scenario is developed. It takes into account the existence of earlier studies and, where appropriate, draws from them. Overall, the goal was to develop a scenario of world demand and supply which would be readily accepted by readers, in particular the Canadian forest industry, as being a credible basis for the subsequent analyses. Details of this can be found in Volume II "World Supply-Demand".

The major conclusion of Volume II is that the forest products industry is healthy and growing internationally. Moreover, we conclude that technological trends increasingly are likely to affect the structure of Canada's product mix. Some of these changes will be beneficial. Others will require that significant adjustments be made.

Overall, Volume II concludes that the global supply-demand situation and outlook for Canada is far different from the pessimism which prevailed when product prices reached record low points, just a few years ago. Today, there are many more suppliers and many more competing products. In future, competition will become tougher. Yet, overall growth in forest products consumption is likely to increase substantially. Far from being a sunset industry, the global market outlook suggests that excellent opportunities lie ahead for Canadian producers.

In subsequent volumes of this study (Volumes III and IV), we provide detailed and in-depth analyses of the competitive outlook for Canada's existing product market mix. We also examine the prospects for major new grades and technologies likely to become important within the next twenty years. While many of the grades will be familiar to the reader, we have tried to avoid the shortcomings of some traditional descriptions of certain types of products.

For example, a growing number of people in the industry feel that traditional descriptions of "woodfree" and "wood-containing" printing and writing papers no longer are appropriate to the markets requirements, or to the technologies in use. Our approach has been to look at the demand for these grades from a consumers' viewpoint, and with technological developments in mind. Volume III deals therefore with the whole area of printing and writing papers and the designations used are more closely in line with those familiar to the European industry. Thus, we talk about mechanical pulp or chemical pulp based printing and writing paper grades, either coated or uncoated. As a result, we seek to provide a strategic perspective and a far-sighted look at this very exciting growth sector for Canada's paper makers.

Volume III also examines the future for other grades of paper and paperboard which are considered of importance to Canada, or specific regions within the country. Newsprint is one of Canada's success stories. It is a sector which brings together, and capitalizes on, Canada's major competitive strengths in high quality fibre and low cost energy. Moreover, as we discuss at some length, the newsprint "family" extends upward into much higher value added printing and writing grades. These also can be produced very competitively in Canada, based on its strength in these competitive factors.

Other commodity and semi-commodity grades of paper and paperboard are analyzed. Volume III indicates that Canada's containerboard and kraft papers sectors do not have any particular competitive advantage. These are low-value products and sensitive to wood cost increases. Nevertheless, the industry has survived well, through specialization and vertical integration. Little new capacity in these grades is expected in Canada, but conversion and upgradings are likely. Similar types of challenges apply in boxboards, but scope for improved competitiveness, through economies of scale, is still open to this sector. Liquid packaging, especially aseptic packaging, will show very strong growth. Multi-layer boards also capitalize on Canada's competitive strengths. Frequently, a combination of softwood and hardwood kraft pulps with bleached mechanical pulps can offer growth opportunities to Canadian companies. It is an exciting area for the more innovative, market focussed companies. In tissues, scope for future capacity expansions exists, principally in the main metropolitan areas.

Also in Volume III, we analyze the competitive outlook for market pulp. One of the overall conclusions of Volume III is that demand for softwood kraft market pulp will continue to expand. Competition from other pulps, particularly hardwood kraft and mechanical, will increase. Moreover, the suppliers of these pulps will be very cost competitive in comparison with most of Canada's existing capacity. Consequently, Canada's former role as one of a few suppliers, and one of the most competitive within this group, will remain under pressure. As a softwood kraft market pulp supplier to the world, Canada has reached the peak of its effective potential for major expansion.

Canada's softwood market pulp sector also is the focus of other sections of the study. Overall, the prospects for profitability in this sector of Canada's industry are mixed. Canada has some large, modern capacity which is based on relatively low wood costs. The outlook for these mills is excellent. They capitalize on Canada's competitive advantages and they optimize economies of scale. Despite shifts in supply and demand, they are well placed in competitiveness and should be kept at state-of-the-art. Much of the remaining capacity, however, is neither modern nor low cost. These mills have a number of options. Some potentially are very attractive. In almost all cases, however, they involve very large capital expenditures for modernization and upgrading or integration. With the wide range of uncertainties facing the marginal mills, the study concludes that special attention to this sector is required if their potential is to be fully realised. Further discussion of this conclusion is provided in this volume (see Sections 2.0, 3.0 and 4.0).

The wood products sector analyses are provided in Volume IV. Softwood lumber exports have been a primary contributor to the sector's growth and prosperity, and US market demand is the principal driving force. Canada's high quality, low cost sawlogs have facilitated this growth. Globally, it is a mature industry. Our analyses indicate that Canada will continue to remain competitive in softwood lumber export markets, but that the future rate of growth in net new capacity and exports will be much more modest.

Volume IV also looks at the panelboard sector, ranging from Canada's limited but important historical role as a plywood producer, to the fast growing reconstituted panelboards, such as OSB and MDF. Over the short term, North American overcapacity is likely to limit growth in many reconstituted board grades: however, longer term growth opportunities are more attractive. It is unlikely, nevertheless, that they will constitute a major driving force in Canada's forest products industry over the next twenty years. The structural changes occurring in the sectors and discussion of future driving forces for the industry are provided in Volume IV and summarized later in this section.

Canada's fibre supply situation is summarized regionally and nationally in Volume V. As noted, this provides the basis for the assumptions used in this study as far as Canada's timber supply is concerned. As requested in our terms of reference, the data used are those provided from existing published sources. Economically available fibre supply is defined in terms of current policies and current levels of management.

With a few regional exceptions, the conclusions suggested by these data are that Canada's growth prospects will exceed its ability to provide sufficient available fibre. We comment on the likely supply response of price increases in fibre in Volume V. This includes, for example, technological responses. As pointed out in Section 4.0 of this volume, other countries, such as Sweden and Finland, faced with a similar problem, have overcome apparent timber shortages in a number of ways and have actually increased forest products output significantly.

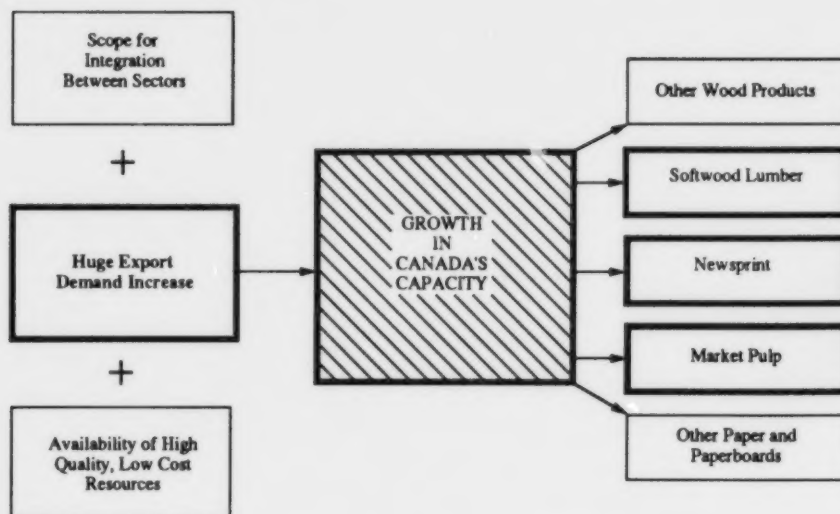
The production costs for major pulp and paper products of interest to Canada are provided, on a global comparative basis, in Volume VI. In addition, detailed analyses of cost trends, by product and by country, are used as a basis for projecting the major elements of production costs to the year 1995 and the year 2010. Volume VI was prepared jointly with Price Waterhouse and contains updated data based on Price Waterhouse's studies for the Forest Sector Advisory Council (FSAC), to the Ministry of State (Forestry) and Department of Regional Industrial Expansion (DRIE).

The analyses show, among other things, that Canada has an exceptionally favourable low cost position in energy but that its fibre costs are likely to shift upwards. Many other countries are in a similar position, but some new low cost fibre areas, such as Brazil and Chile, are likely to remain highly competitive. The desire of newly industrialized economies to develop their forest products industries for export earnings, and serving expanding domestic needs is likely to be an ongoing fact of life for the more traditional areas. Canada's cost position in fibre, labour, delivery and energy is explored, region by region. These analyses form part of the assumptions of Canada's future competitive position, compared with existing and future competing suppliers.

1.3 PAST AND CURRENT ENGINES OF GROWTH IN THE SECTOR

The starting point for the study is the observation that Canada's exceptionally good export performance over the past forty years or so can be attributed to three principal engines of growth in export markets. These are softwood lumber, softwood bleached kraft market pulp and newsprint (Figure 1-2).

Figure 1-2
Canada: Engines of Growth in Capacity



Various conditions have been conducive to this exceptional performance. As Figure 1-2 shows these engines of growth have been facilitated by some favourable circumstances. The strong growth in export demand has been supported by Canada's unique supply capability and an increasingly close inter-dependence between the wood products and the pulp and paper sector.

Export Demand Increase

Undoubtedly, the single most important driving force behind Canada's very significant expansion in overall manufacturing capacity over the past forty years has been the growth which has occurred in export markets. These markets have been significant for all major grades of forest products, and have been more important and more geographically focussed for some grades than others. Nevertheless, Canada's strong position in these grades could not have been achieved without its excellent performance in building world class mills, generally at economy of scale and achieving high levels of productivity and cost competitiveness.

In wood products, for example, rapid growth in the US market for housing and other commodity grade lumber consuming sectors, helped to boost Canada's supply role to a record one third share of the US market by 1985. The lumber sector was assisted by favourable conditions for expansion, notably in Canada's high quality, low cost fibre resources. Canada's advanced manufacturing techniques, however, also helped in this process: so too did its achievements in productivity, such as small log processing and its large, low unit cost mills.

Canada's softwood kraft market pulp sector has been a very strong engine of growth during a period when it was one of a few suppliers. The world's paper makers traditionally paid a premium for the strength and brightness characteristics of bleached northern softwood kraft pulps. As with softwood lumber, export demand combined with Canada's excellent and untapped softwood resources, plus functional integration with the sawmilling sector, were major factors supporting expansion. Canada became the world's largest single supplier of softwood kraft market pulps. It became so dominant in international markets, that strikes affecting only a portion of Canada's market pulp mills could have a significant influence on world market pulp prices.

The US is an important market and, at the peak of its market share, Canada accounted for 95% of US pulp imports (in 1975). Exports of pulp to the US continue to increase, even though Canada's share of US pulp consumption has been declining for a long period of time. Nevertheless, it is important to note that about half of Canada's export pulps are shipped to non-US markets.

Newsprint, the third engine of growth has a long history of expansion. Over the past forty years it has been boosted by strong US and offshore demand, based on Canada's competitive cost position and ability to supply a high quality product to US and offshore publishers. Canada has achieved a fairly stable 60% share of the US newsprint market, and has been able to capitalize on its abundant resources of low cost energy.

Also Canada's export market performance in recent years has been influenced positively by its favourable position in exchange rates. Notably this has been in relation to the US dollar but, since early 1985, also in relation to some other major currencies.

The impact of the export demand increases on these three engines of growth can be seen very easily in Canada's excellent performance in international trade in forest products and particularly its very large market share in many instances.

We provide below a selective review of trends in Canada's forest products trade. The analysis concentrates on Canada's three main forest product commodity groups, softwood lumber, newsprint and softwood market pulp, but we also look briefly at other product categories of significance. Particular emphasis has been placed on Canada's trade performance with the US and, separately, in offshore markets as a group. Less emphasis has been placed on Canada's domestic market even though this is an important market area. Eastern Canada, for example, consumes 50% of the output of its own sawmills, or around 4.5 billion board feet per year. Also, Canada consumes a small (12-13%) but declining percentage of its own kraft market pulp output: however, it consumes an increasing proportion of its total pulp output, through integration. Our emphasis on export market performance is important for our analysis. This is because external factors are the real engines which drive the structure and development of Canada's forest products industry.

Softwood Lumber

Over the past fifty years, Canada has substantially increased its share of the US market for softwood lumber. In 1985, its market share reached an estimated 33.4% (Table 1-1), but this declined to around 29% by 1987. Much of this product was construction grade lumber going into residential housing. US producers¹ captured a much larger share of their domestic higher value markets.

Table 1-1
A 50-Year Perspective of US/Canada Trade
US Imports of Softwood Lumber from Canada

	1935	1945	1955	1965	1975 ¹	1985	1987
Volume (billion fbm)	0.3	0.8	3.2	4.8	6.8	14.3	14.4
% of US Imports	87	88	97	98	98	99	99
% of US Apparent Consumption	2	4	10	15	21	33	29

¹ Recession year distortion. Data are 1974 plus 1976 average.
Source: COFI and USDA

Over the last twenty years, US market demand clearly has been a major engine of growth in the lumber industry.

By 1987, even with the continuing expansion of US lumber demand, Canada's exports to the US had clearly reached a plateau. US mills were able to increase their output without increasing capacity and in the past few years have accounted for almost all the increment in supply. US self-sufficiency clearly has been increasing. Canada still provides for 99% of US imports of softwood lumber, but the adverse impact of protectionism, as a result of the successful countervailing duty action initiated by the US softwood lumber industry, has added a new negative factor to the competitive environment in the US.

In Volume IV, we discuss Canada's softwood lumber sector in detail. One of the conclusions of our analysis is that the period of rapid growth of the sector is over, as far as exports of lower priced commodity grade softwood lumber to the US are concerned. Later in this volume we discuss the implications of this conclusion.

¹ For example, treated lumber manufacturers from the US South.

Canada also has increased its softwood lumber exports to offshore markets (Table 1-2), but the volume in 1985 was only marginally higher than it was twenty years ago, in 1965. Since 1985, offshore export performance has improved. With the dramatic recent increases in offshore exports due to favourable exchange rates and Canada's successful market development efforts, the significance of markets other than the US is growing.

Table 1-2
A 50-Year Perspective of Growth of
Non-US Markets for Canadian Softwood Lumber

	1935	1945	1955	1965	1975 ¹	1985	1987
Volume (million fbm)	1,100	1,000	1,300	1,750	1,500	2,050	3,050
Non-US as a % of Canada's Total Exports	75	55	29	28	29	12	17

¹ Recession year distortion. Data are 1974 plus 1976 average.
Source: COFI

Softwood Market Pulp

Shifts in market pulp trade occur as a result of factors such as: a) changes in comparative cost positions; and b) technological advances in papermaking.¹ Canada's export trade performance indicates that offshore markets have become increasingly significant. Over the past fifty years, Canada has increased its share of the US market for pulp imports, and has a strong position. However, until recently, its share of total US consumption (captive plus market pulp) has remained remarkably constant, varying little from an 7-8% share of the total US market. The significance of these statistics² (Table 1-3) is that they provide a realistic indication of Canada's consistent, but limited, supply role in an overall North American context.

¹ For example, increased use of hardwood pulps which provides desirable properties for printability and related characteristics.

² Most statistics of Canada's share of the US market measure only market pulp, in which Canada is a major supplier.

Table 1-3
A 50-Year Perspective of US/Canada Trade
US Imports of Pulp from Canada

	1935	1945	1955	1965	1975 ¹	1985	1988e
Volume (thousand tonnes)	491	981	1,696	2,556	3,390	3,660	3,930
% of US Imports	28	62	84	90	95	90	89
% of US Apparent Consumption	8.1	9.2	8.4	8.4	7.3	7.4	7.3

¹ Recession year distortion. Data are 1974 plus 1976 average.

e estimated

Source: API

This has some sobering implications for Canadian export potential to the US. Until 1980/81, total US demand for market pulp was served 53% by Canada; 46% by the US and perhaps 1% by Scandinavian suppliers. This was a market share relationship which hardly varied year after year.

Recently, however, it has shifted against Canada. The US now accounts for 54% of its domestic needs for market pulp (despite the relatively low value of the Canadian dollar over the past five years). Non-Norscan producers (notably Brazilian eucalyptus) although small in volume, have been priced and sold aggressively in the US market. Brazilian exports to the US effectively "knocked out" the equivalent of one Canadian softwood market pulp mill by 1985, and more since. The Scandinavians, helped by a significant exchange rate advantage (which has been reduced since 1985), also shipped larger volumes to the US. In consequence, Canada has increased its volume shipments but has lost market share. As discussed in Volume III the outlook, already in evidence by an average increase of US market pulp production of 100,000 tonnes every month since 1980, is of more US self-sufficiency and a wider base of pulp imports (e.g. Brazil, Chile).

Offshore Markets for Canadian Market Pulp

Canadian market pulp shipments to offshore markets (Table 1-4) over the past ten years have grown faster in volume terms than those to the US. Shipments to the US (Table 1-3) were only 260,000 tonnes higher in 1985 than the 1975 average, or the equivalent of one Canadian mill. Offshore buyers, in the same period, purchased the equivalent of two new mills by 1985. Over the next three years to 1988, the offshore export market absorbed an additional 600,000 tonnes, equivalent to the output from a further two Canadian mills. This increase clearly was helped by the weak Canadian dollar and very strong world demand for pulps.

Table 1-4
A 50-Year Perspective of Growth of
Non-US Export Markets for Canadian Market Pulp

	1935	1945	1955	1965	1975 ¹	1985	1988 ^e
Volume (thousand tonnes)	120	310	450	940	2,890	3,480	4,080
% of Total Exports to Non-US	20	24	21	27	46	50	56

¹ Recession year distortion. Data are 1974 plus 1976 average.

e estimated

Source: CPPA

Future growth in BKP exports may not be so bright. Later in this volume, we discuss how in many of its kraft market pulp mills, Canada has not maintained the level of expenditures necessary to achieve or stay at the state-of-the-art. Consequently, mill efficiency and thus operating costs, have suffered. In energy costs per tonne, for example, almost all Canadian mills are far above the levels typical of competitors in Sweden and Finland.

The recent Price Waterhouse Forest Sector Advisory Council (FSAC) study (referred to in Volume VI) prepared for the Canadian Government, shows that Finland and Sweden enjoy much lower average purchased energy costs per tonne of pulp, compared with the BC Coast and Quebec. Closing this energy cost difference in kraft mills involves some trade-offs. Energy costs per tonne can be reduced, but this can increase pollution problems and decrease equipment life. Nevertheless, Canada has much scope for improvement. Many of its kraft mills are old and technologically obsolete.

In addition to energy costs, we also discuss later in this volume, the likely impact on market pulp costs of the capital injections which could be required to meet new and increasingly stringent environmental controls in many areas of Canada. The implications for public policy are described in Section 4.0 of this volume.

Newsprint

Newsprint and its technologically related products such as directory papers and other uncoated groundwood papers, have been a major component of Canada's successful growth in export markets. Canada has a very strong competitive position in this technology grouping because of its high quality fibre base and its low power costs. Production of these grades maximize Canada's wood quality and power cost advantages. Not surprisingly the newsprint and groundwood printing papers sub-sector has experienced rapid growth in Canada during the buoyant markets which have prevailed recently (also see Volume III).

Canada's export trade performance in newsprint is reviewed in Tables 1-5 and 1-6 below. Groundwood printing paper exports from Canada are discussed later, but the data below for newsprint also include some exports of these grades.

Table 1-5
A 50-Year Perspective of US/Canada Trade
US Imports of Newsprint from Canada

	1935	1945	1955	1965	1975 ¹	1985	1987
Volume (thousand tonnes)	1,925	2,418	4,599	5,528	5,988	6,674	7,087
% of US Imports	92	100	97	96	99	95	95
% of US Apparent Consumption	66	79	77	71	66	58	58

¹ Recession year distortion. Data are 1974 plus 1976 average.
Source: CPPA and API

Canada accounts for the bulk of US newsprint imports and presently has a 58% share of US consumption. Overall demand has continued to grow. Despite shifts in consumption patterns,¹ modest inroads by offshore suppliers, and a recent loss of market share, Canadian capacity has fared well from its orientation to the US market.

In offshore markets, Table 1-6 shows that Canada's export performance has suffered over the past ten years. Of particular concern has been the downgrading of Canada's status as a supplier to EEC markets and preferential treatment of EFTA suppliers (Finland and Sweden) by the EEC. The resurgence of domestic newsprint production in the UK has adversely impacted on Canadian exports. The prospect of a "closed" or "further restricted" EEC market to outside supply beyond 1992 is of considerable concern, especially to eastern Canada.

Table 1-6
A 50-Year Perspective of Growth of
Non-US Markets for Canadian Newsprint

	1935	1945	1955	1965	1975 ¹	1985	1987
Volume (thousand tonnes)	660	620	670	970	1,510	1,290	1,491
% of Total Exports to Non-US	26	20	13	15	20	16	17

¹ Recession year distortion. Data are 1974 plus 1976 average.
Source: CPPA

Other Paper and Paperboard

Over the ten year period 1975-85, Canada's exports of paper (excluding newsprint) and paperboards increased by almost 230%.

¹ For example, daily newspapers and inserts, community papers versus catalogs.

Almost all of the increase was in: a) groundwood papers; and b) a small grouping of other grades such as building papers, corrugating medium and boxboards.

In export markets, Canada's performance in these grades has been impressive. Volumes have increased from 0.9 to 2.0 million tonnes between 1975 and 1985 (Table 1-8). Moreover, much of the volume is to the US which in 1985 accounted for an estimated 80% of Canada's exports of these grades (see Table 1-7).

In the period 1984-86, when North American demand for all papers and paperboard expanded at an even faster rate than before, Canada's domestic performance in these "other grades" also has been favourable. Domestic demand for printing and publication grades appears to have syphoned off some potential export capacity, particularly to the US, but a stronger performance has been achieved in paperboards.

Table 1-7
US Imports of Paper and Paperboard from Canada
(excluding Newsprint)

	1961	1965	1970	1975 ¹	1980	1985	1987
Volume (thousand tonne)	65	113	354	535	1,169	1,460	1,479
Value (million C\$)	12	24	68	152	527	953	1,093
% of Canada's Exports volume	29	32	39	45	61	74	69
value	30	35	47	44	60	81	70
% of Canada's Production volume	43	5	10	13	23	31	23
value	3	5	10	11	20	27	26*

¹ Recession year distortion: data are 1974 plus 1976 average
Source: CPPA, API and Statistics Canada

* estimate

Table 1-8
Canadian Exports of Other Papers & Paperboards
 (000 tonnes)

	1975	1985	Volume Change	1987	Volume Change
Printing and Publication					
Groundwood Papers	127	514	+387	901	+387
Other Printing	152	257	+105	282	+25
Total	279	771	+492	1,183	+412
Total Consumer/Industrial Tissue & Sanitary	7	53	+46	64	+11
Packaging & Containers					
Containerboard Grades	228	425	+197	544	+119
Boxboard Grades	10	61	+51	80	+19
Wrapping/Building ¹	348	675	+327	742	+67
Total	586	1,161	+575	1,366	+205
Total Other Paper & Paperboard	872	1,985	+1,113	2,613	+628

¹ Includes printed wallpaper and converted grades.
 Source: CPPA

Integration Between the Sectors

Earlier, we pointed out (Figure 1-2) that increasingly close inter-dependence between the wood products and the pulp and paper sectors has provided favourable conditions for Canada's engines of growth to achieve the exceptional performance which has occurred. In the section below, we discuss the impacts of this integration. It is important to acknowledge that this integration has not come about by accident. Clearly, it is supported strongly by market economics, but has been the deliberate result of provincial policies to achieve better utilization of Canada's public timber, as discussed more fully in Section 4.0 of this volume. When we examine the international market prospects awaiting Canada's forest sector to the Year 2010, we conclude that public sector policies over timberland utilization and achievement of a favourable investment climate will be crucial factors in deciding the extent of its success.

The goal of integration is to achieve benefits that might not otherwise be obtained. Vertical integration (Figure 1-3) could involve, for example, a pulp mill developing control over new fibre sources (reverse integration) or control over distribution and end markets (forward integration). In horizontal integration, a sawmill for instance could achieve important economies of scale or synergies through control over, say, a particleboard or MDF plant which utilises its by-product sawdust.

In the past twenty years, the industrial structure of Canada's forest products industry has benefited significantly from increased integration. In some cases, this has involved integration between operations within a particular corporate group. In most cases, however, it has involved increasing interdependence between the sectors. For example, pulp mills have become increasingly dependent on the sawmill sector for chip supply, even though in many cases, this is not captive in the ownership sense. The scope which existed for increased interdependence has helped the industry to achieve some of the major gains in economics which have fuelled the engines of growth.

Figure 1-3
Growth Options for Manufacturers

1. Replication i.e. more of the same
2. Upgrading i.e. capturing higher value added potential
3. Integration i.e. achieving synergies through control over supply or markets

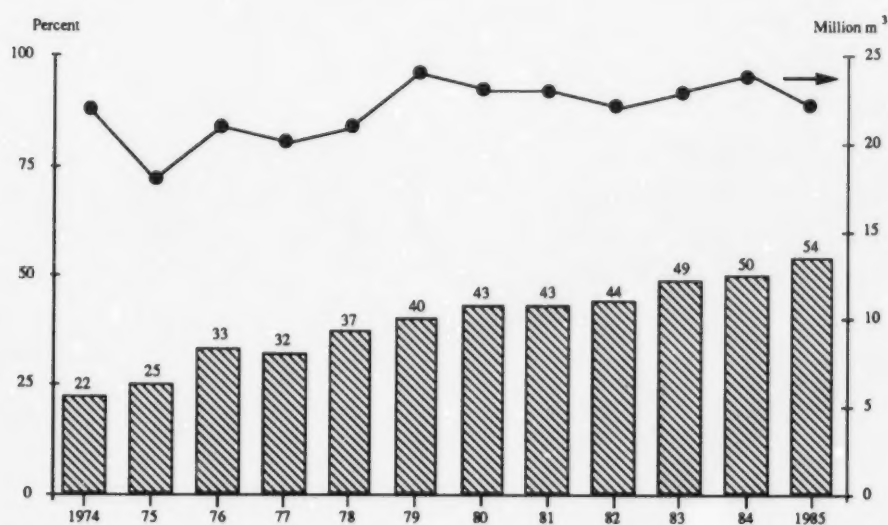
Vertical
Integration



Source: WRA

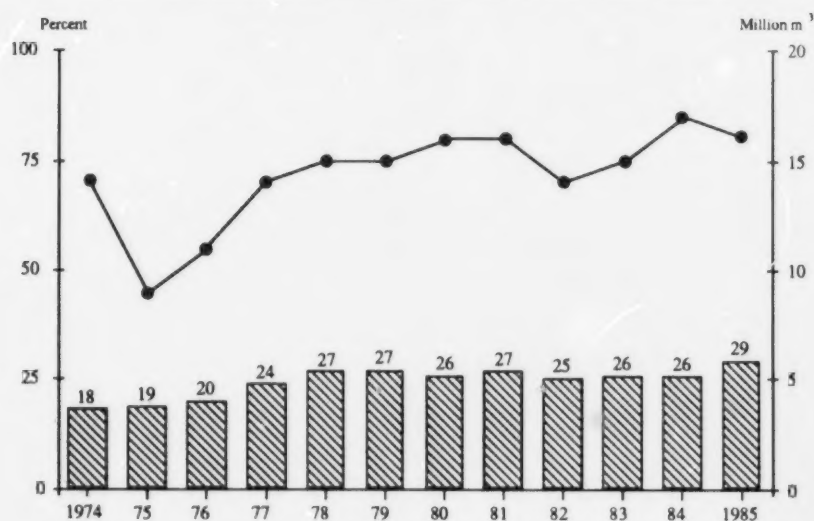
There is little doubt that the expansion of Canada's sawmilling industry has been a major source of growth, particularly in the provision of chips. The importance of chips, compared with pulpwood utilization in Canada's three major regions is summarized in Figures 1-4 to 1-6.

Figure 1-4
Quebec: Wood Chips as a Percentage of
Total Virgin Fibre Consumption by Pulp & Paper Sector



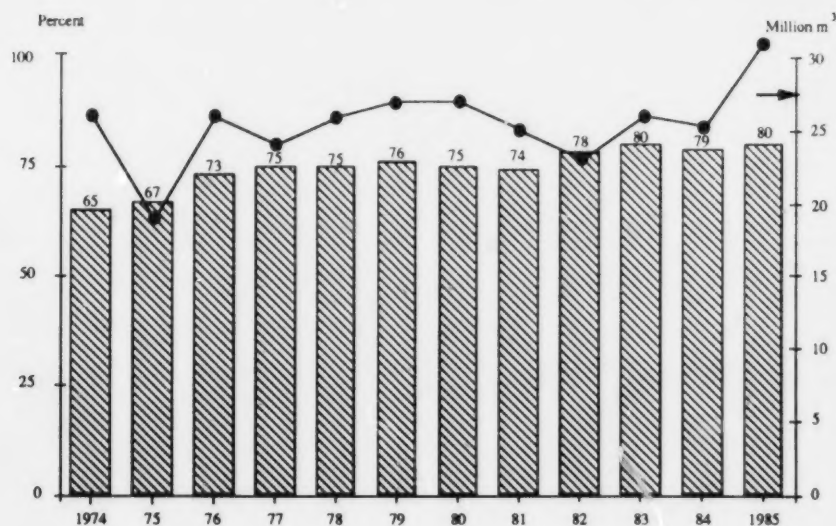
Source: Statistics Canada

Figure 1-5
Ontario: Woodchips as a Percentage of
Total Virgin Fibre Consumption by Pulp & Paper Sector



Source: CPPA, Statistics Canada

Figure 1-6
BC: Woodchips as a Percentage of
Total Virgin Fibre Consumption by Pulp & Paper Sector



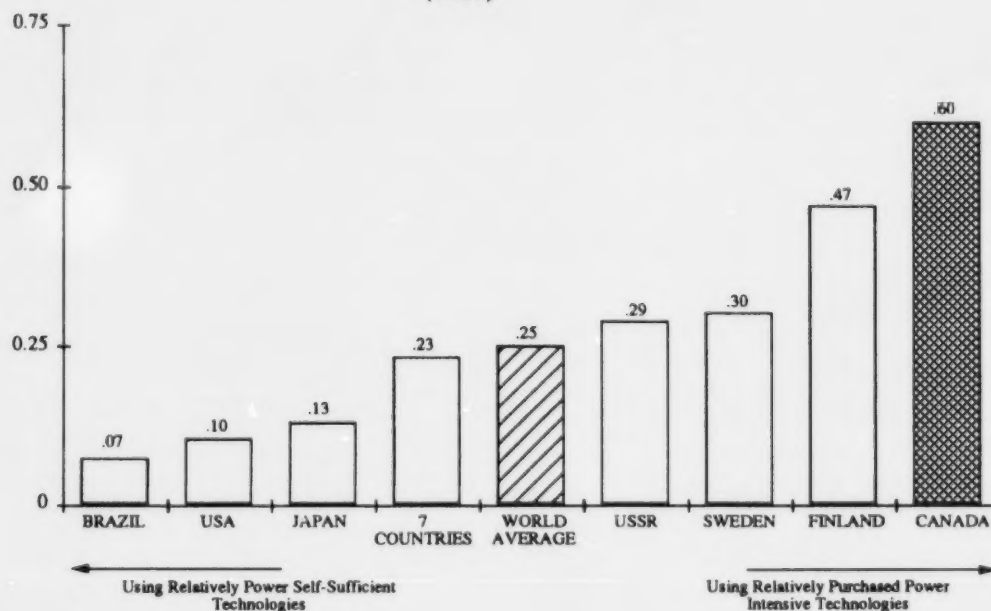
Source: CPPA, Statistics Canada

Chips have become increasingly important to pulp mills and to newsprint mills, assisted by well-known advances in process technology. In Volume V, we examine the future availability of chips, and future fibre cost trends likely to result from increased dependence on higher cost pulpwood, as a result of much slower rates of volume growth in Canada's lumber sector.

By Exploiting its Advantage in Mechanical Pulps, Canada is achieving a Higher Degree of Horizontal Integration

As could be expected, the Canadian forest industry has been quick to capitalise on some of its advantages in mechanical pulp production. On a comparative basis, Canada produces more mechanical pulps, as a proportion of its chemical pulp production, than any other leading producer (Figure 1-7).

Figure 1-7
Mechanical Pulp to Chemical Pulp
Production Ratio
(1980)



Source: Westerberg (1987)

Note: 7 countries is the average of Brazil, USA, Japan, USSR, Sweden, Finland, Canada

The world average in 1980 was about 1 tonne of mechanical pulp production for every 4 tons of chemical pulp production. Although production of mechanical pulps has been increasing in volume terms, these grades had been decreasing as a proportion of total production. This trend was arrested in the mid 1980s. The rapid adoption of TMP and CTMP pulps has accounted for most of the recent growth in mechanical pulp, while stone groundwood capacity has declined.

Areas of high purchased energy costs, such as Japan and the US, use relatively power self-sufficient pulping technologies (i.e. kraft). Others with comparatively low purchased power costs, or with market positions which favour power intensive paper and paperboard grades (notably Finland, in publication papers and Sweden, to a lesser extent, in newsprint) are relatively intensive users of mechanical pulps.

Recent and very significant improvements in mechanical pulping technologies, combined with future cost pressures and the improved products quality available from these pulps, indicated very good future prospects for TMP, bleached CTMP and PGW.

Only recently, however, had Canada begun to exploit its potential in these technologies. TMP correctly was perceived as a replacement for SGW and sulphite pulps in newsprint and was adopted readily by the large producers. Its natural successors, CTMP and bleached CTMP, were developed in Sweden and these technologies found their way into application in Canada mainly through the smaller independent operators of CTMP/bleached CTMP market pulp mills. (Frequently sawmilling based companies such as Quesnel River Pulp and more recently Miller Western and Fibreco). Much of the pioneering work in Canada was carried out by small sized to medium sulphite market pulp companies (Tembec) or sulphite-newsprint producers (Ontario Paper). Ontario Paper developed the OPCO process, and was instrumental in this regard.

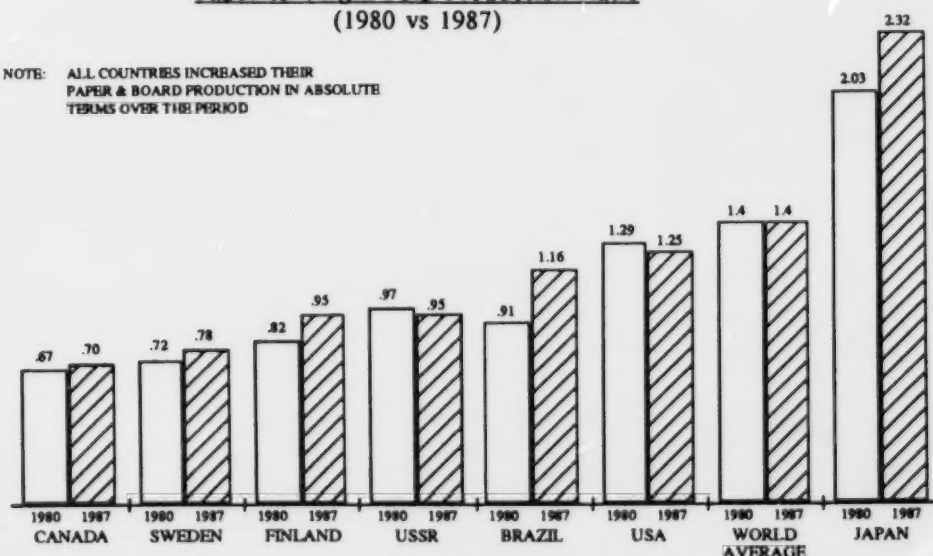
The Canadian pulp industry has become increasingly forward integrated into papermaking. In the seven years from 1980 to 1987, Canada's paper production as a proportion of its virgin pulp production (i.e. excluding recycled fibres, fillers and coatings) increased from 67% to 70%. Part of the reason was increased mechanical (TMP/CTMP) production integrated on-site with production of newsprint and, in a few cases, higher value publication grades such as supercalendered paper.

There was also some integration of chemical pulp. Examples include Great Lakes' integration to uncoated woodfree paper grade at Dryden and Repap's partial integration to LWC at Newcastle. Other examples include Domtar's uncoated woodfree mill at Windsor, and Weyerhaeuser's uncoated woodfree mill at Prince Albert which are scheduled to come on-stream very shortly. Moreover, the pace of integration seems likely to accelerate. Overall, however, most of the integration appears to have been of mechanical pulp grades (e.g. TMP/CTMP) into newsprint and publication grades. Moreover, as might be expected, the majority of this was based on new mechanical pulp capacity. Abitibi-Price, for example, has integrated new CTMP capacity into production of groundwood specialties. Non integrated mechanical pulp (e.g. CTMP, bleached CTMP) increased over this period, but there were only very limited amounts of RMP/TMP remaining as non-integrated capacity and therefore available for upgrading.

Although Canada performed well in its forward integration, it did less well over this period than Sweden, Finland, and Brazil (Figure 1-8). Forward integration or installation of new integrated capacity in Finland was very rapid over the 1980-87 period. Among the major consuming countries, the US produced proportionately less paper in 1987, in relation to virgin pulp production, than it did in 1980. For Japan, the reverse was true: its virgin pulp production was increasingly integrated with its domestic pulp making production.

Figure 1-8
Paper to Virgin Pulp Production Ratio
(1980 vs 1987)

NOTE: ALL COUNTRIES INCREASED THEIR PAPER & BOARD PRODUCTION IN ABSOLUTE TERMS OVER THE PERIOD



Analysis of these various components suggests a number of interesting developments. Firstly, in Canada, the degree of effective horizontal integration between the various sectors has increased significantly. A much higher degree of efficiency and productivity has been achieved over time through a closer relationship between the woodlands, wood products and pulp and paper sectors. Much of the credit for this can be attributed to provincial forest ministry policies and programs which have set the rules for tenure and utilization standards on Canada's public timber lands. Progressively, the provincial ministries have tightened up utilization standards, in many cases through pricing policies to achieve the high degree of inter-dependence which exists today. In addition, one of the sector's major historical engines of growth, the massive increase in softwood lumber exports to the US, clearly has been the driving force which has made this integration possible.

Secondly, regional growth in new capacity in Canada has been well balanced over the past two decades. It is well balanced in the sense that Eastern Canada, while still clearly driven by the papermaking sector, has also experienced growth in capacity in market pulp and wood products. Moreover, Eastern Canada also is now achieving growth towards integration and higher value added papermaking. The regional situation is discussed more fully in Section 3.0 of this volume.

Similarly, Western Canada, while still very important in the lumber sector, also has achieved a significant degree of diversification from its original base. Its integration into higher valued products nevertheless clearly lags that of Eastern Canada.

1.4 FUTURE ENGINES OF GROWTH

One of the major conclusions of the study is that two of Canada's three traditional engines of growth in the forest sector are slowing, as far as expansion in net new capacity is concerned. Certainly, there will be further development, but not at past rapid rates.

In the softwood lumber sector, the world market for commodity construction grades is mature and growing very slowly. Moreover, the terms of trade have swung against Canada in its major market, the US. As a result of the recent countervailing action, Canada's cost structure in these commodity grades has suffered. In the market pulp sector, Canada's position has shifted from being one of the few to one of the many. New sources of supply have been emerging and new, and often better, grades of pulp have been developed. Although market requirements still favour Canada's products, some end users favour the goods of other suppliers.

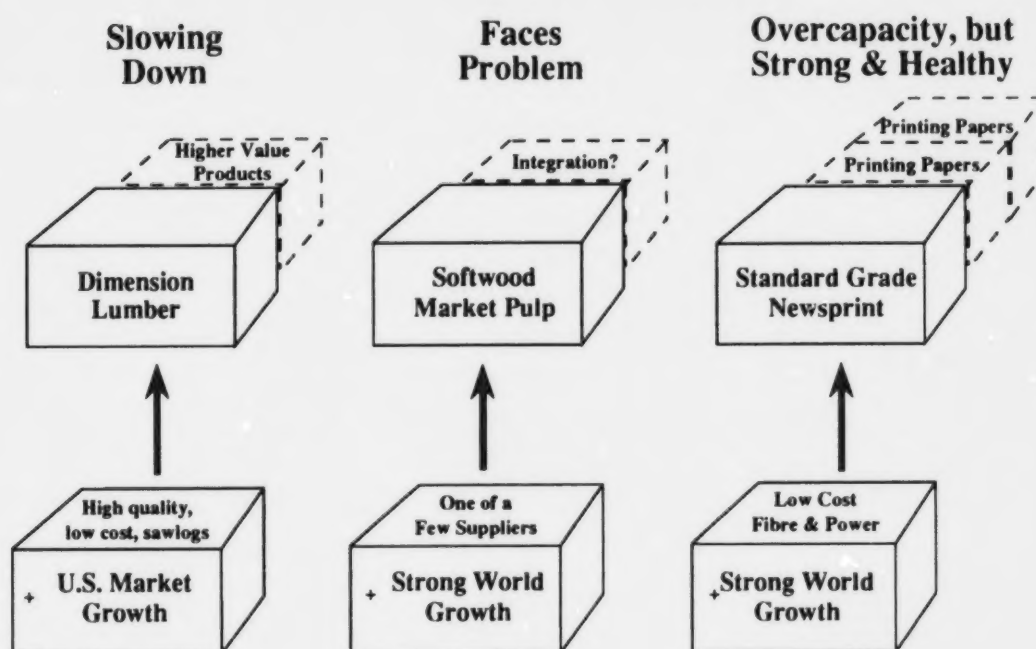
Softwood lumber and softwood market pulp are still vital parts of Canada's industry and, with upgradings and optimization of individual units, Canada will remain cost competitive globally in these products. Moreover, Canada has excellent prospects to expand future capacity in standard grade newsprint, in which it is very competitive in cost and quality. Nevertheless, Canada must look to other products to achieve a significant thrust of expansion, on the scale experienced in the past. Many of these new engines of growth are being created and have good prospects of providing much of the impetus required to achieve further significant rises in exports. Importantly, many of these are higher value-added.

Canada's capability and product range has been expanded recently to include new products which hold considerable promise for the future. These include LWC, woodfree printing papers, SC papers, CTMP market pulps and higher valued papers in the newsprint family. In wood products, higher grades of lumber are being produced and expansion is occurring in panelboards such as OSB and MDF.

One of the overall effects is that Canada's forest products mix will continue to move away from dominance by the three traditional commodity categories. The evolution has been taking place for some time, but slowly. In the coming years it is likely to gain momentum. The situation is illustrated in Figure 1-9. More specifically, Canada's forest industry has seen an unprecedented surge in new capital spending in the current cycle and this appears likely to continue well into 1989.

Nevertheless, we conclude that in order to achieve significant growth in these new higher value products, further restructuring, rationalization and new investment will be essential in Canada's capacity in the three traditional commodity categories. In each of these categories, Canada already has many state-of-the-art, cost and quality competitive super mills. Others fall into an average category: some facilities are marginal except under very favourable product price conditions.

Figure 1-9
Canada's Three Major Engines of Growth



The restructuring process which is taking place at a rapid rate today, with record levels of capital expenditure, has to continue for some time if an adequate and balanced base in (a) the traditional commodity grades and (b) the new grades is to be achieved. It will not be a painless process of restructuring. Over-capacity and very low prices are likely in some grades during the transition. Marginal capacity is likely to be penalized.

Most companies are reasonably well placed financially to develop more of the supermills which will be necessary. Moreover, they appear to be more confident, than a few years ago, with a vision of the things that they can do well. In some sectors, however, such as market pulp, they face some formidable uncertainties and the upgrading process may not proceed as rapidly as market conditions would merit (see Sections 2.0 and 3.0). Moreover, investment in some of the higher value-added grades will call for a shift in thinking, and increased commitment, by the major partners in the industry, notably government as landlord of most of Canada's commercial forest resources and industry's senior management as investment decision-makers. Willingness to commit major capital and efforts to shift towards more innovative products (see Sections 2.0 and 4.0) will hinge upon mutually acceptable goal definition and development strategy.

There is no doubt that the health of Canada's forest products industry will depend on achieving a good balance between a highly competitive, large volume-low unit cost commodity sector and growth in these new products. Supermills producing softwood lumber, market pulp and newsprint, will continue to be the backbone of Canada's forest economy (Figure 1-10).

Figure 1-10

- Large volume low unit cost commodity products, such as softwood lumber, standard grade newsprint and market pulps will continue to be the mainstay of Canada's forest economy to the Year 2010, and beyond.
- In addition, Canada will experience fast rates of capacity growth in new and higher value-added products. These products, which are specialties and semi-commodities today, will become a major part of its export product-mix in the future.
- Some of this growth can be achieved by forward integration with existing capacity. It will require large volume manufacturing units, producing high quality grades meeting specific market requirements. These will be the Supermills of the future.

The combination of large-scale, low-unit cost facilities producing Canada's three major forest product commodities, softwood lumber, market pulp and newsprint, together with growing capacity in the new products which exploit Canada's competitive advantages including high quality resources, will provide a favourable base for the future.

1.5 SUMMARY OF GROWTH PROSPECTS TO 2010

Our projections indicate that, for Canada as a whole, the value of the sector's output will expand from an estimated \$26.7 billion in 1987 to \$33.4 billion by 1995 and \$41.5 billion by the Year 2010, expressed in 1987 dollars. This represents a 55% real increase in output value over the period (Figure 1-11).

Figure 1-11
Canada's Growth Prospects in Forest Products

	1987	1995	2010
	(Billions, 1987 Cdn. Dollars ¹)		
Wood Products Sector	7.9 ³	9.2	10.1
Pulp and Paper Sector ²	18.8	24.2	31.4
Total	<u>26.7</u>	<u>33.4</u>	<u>41.5</u>

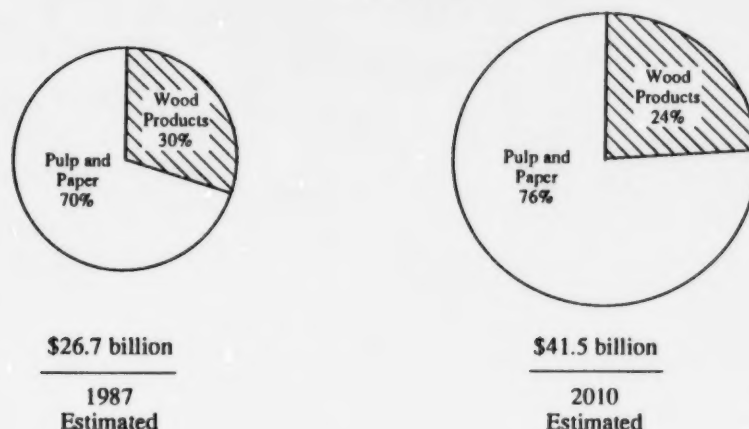
¹ approximate net sales value of output

² excludes value of output of allied operations, converting, etc.

³ Based on 1985 volume data

Canada's wood products sector accounted for an estimated 30% of this total output value in 1987, compared with 70% for the pulp and paper sector (Figure 1-12). We project that both sub-sectors will increase in absolute importance because of (a) volume expansions and (b) an upward shift towards a higher value product mix. Nevertheless, as already discussed, growth in the pulp and paper sector will be relatively stronger. By the Year 2010 we project that pulp and paper will account for around 76% of the sector's output value. Moreover, the two sub-sectors will become increasingly integrated over this period.

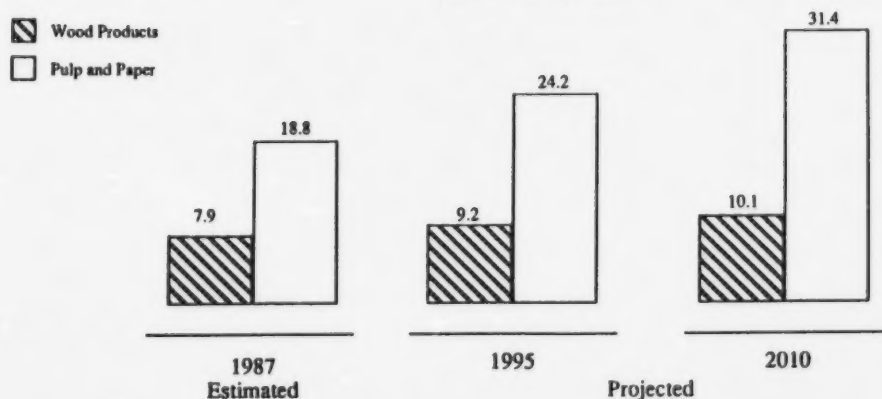
Figure 1-12
Canada's Forest Industry: Value of Output
 (1987 C\$)



Source: WRA

Growth in output value will be fairly evenly spread between the periods, as far as the sector as a whole is concerned. Value growth for wood products, however, is likely to be stronger in the 1987-95 period than subsequently (Figure 1-13). This is because rationalization already is taking place and, in the short term there will be a more rapid shift to a higher value product-mix in wood products than in the pulp and paper sector. The reverse is likely to be true for the subsequent period 1995-2010 when the pulp and paper sector will increasingly integrate and capture higher value added. The reasons for this are discussed by product grouping later in this section (e.g. see Figure 1-15).

Figure 1-13
Canada's Forest Industry: Value of Output
 (billion 1987 C\$)



Source: WRA

On a product-by-product group basis, we have summarized the projections of the study in Figure 1-14 for the wood products sector and in Figure 1-15 for pulp and paper. Annual percentage growth in the value of Canada's lumber output is likely to be fairly slow, around 0.5% per year compared with an average of 1.7% per year for the pulp and paper sector and very strong growth of around 3.2% per year for reconstituted boards (e.g. MDF, laminated boards etc.).

Figure 1-14
Canada's Growth Prospects
Summary for Wood Products Sector

	Production Volume (million m ³)			
	1985	2010	Growth Increment	Percent per year
Lumber	53.9	61.0	7.1	0.5%
Panel Products:				
Plywood	2.0	2.2	0.2	0.5%
Reconstituted Boards	2.5	5.6	3.1	3.2%

Source: Volumes II and IV

Generally, commodity lumber values are likely to remain static to declining in real terms: however, a shift towards specialties (such as structural engineered products) will help offset some of this poor price performance. Moreover, further productivity gains are likely to be achieved as the industry finds better and more effective ways of processing lumber for value. Volume IV provides additional details of these projections.

In pulp and paper, printing and writing papers are projected to be the major growth grades on a percentage basis (Figure 1-15). Initially, the strongest growth is likely to be in the mechanical pulp based grades (such as coated and uncoated publication papers) as Canada exploits its competitive advantage in power costs and as smaller uneconomic newsprint mills are upgraded (see Volume III). Nevertheless, the strongest overall rate of growth is likely to be in freesheet grades as an increasing volume from the marginal portion of Canada's kraft market pulp capacity becomes forward integrated and expands into the US market. As indicated elsewhere, hardwoods will play an increasingly important role in this process.

Newsprint capacity also is likely to expand in Canada, as more mills and machines join the elite or super mill category (see Section 2.0) and as marginal capacity in this grade is eliminated. Linerboards, particularly the newer bleached grades, including white top and similar grades orientated to higher value packaging markets, also are likely to be a growth area (see Volume III).

Tissue papers are expected to continue to expand in response to regional demand, increasingly using bleached mechanical pulps in place of bleached kraft.

Some boxboard grades will experience modest expansion: however, corrugating medium is likely to suffer as US boxboard plants begin to dominate the Canadian market growth for corrugated containers. Unbleached kraft papers are expected to decline in significance.

In market and affiliated pulps, the volume of true market softwood kraft produced by Canada is projected to decline. New greenfield capacity will emerge in this grade, but it will not offset the loss in volume from conversions and integration into paper and board making.

Bleached hardwood kraft market pulps, however, will increase in significance and strong growth is expected in this product. Mechanical pulps, particularly the bleached mechanicals such as hardwood and softwood CTMP, are projected to increase significantly in volume and in their overall impact on papermaking in North America.

Figure 1-15
Canada's Growth Prospects
Summary Pulp & Paper Sector
Production Volume
(million tonnes)

	1987	1995	2010	1987-2010 Growth Increment	
				Volume	Percent per year
Newsprint	9.0	10.3	12.9	3.9	1.58
Printing & Writings					
Mechanical	2.0	3.5	5.2	3.3	4.24
Freesheet	0.9	1.6	2.4	1.5	4.36
Linerboard	1.2	1.6	1.7	0.5	1.50
Kraft Papers	0.5	0.4	0.4	(0.1)	(0.97)
Corrugating Medium	0.7	0.7	0.7	0.0	0.00
Boxboard	0.5	0.5	0.6	0.1	0.80
Tissue	0.5	0.6	0.7	0.2	1.47
Other	0.8	0.8	0.8	0.0	0.00
Total Paper/Board	16.1	20.0	25.4	9.3	2.00
Pulp Market & Affiliated					
Bleached Softwood Kraft	7.3	6.3	5.8	(1.5)	(1.00)
Bleached Hardwood Kraft	1.1	2.1	2.8	1.7	4.15
Mechanical	0.6	1.9	2.9	2.3	7.09
Total	9.1	10.3	11.5	2.4	1.02
Total Pulp, Paper & Board	25.1	30.3	36.9	11.8	1.69

Source: Volume II and III

NOTE: Summary Volume Data are Rounded:
MAY NOT ADD TO TOTALS

On a regional basis, we have summarized the growth prospects in Figure 1-16. Further details, by grade, are provided in Section 3.0 of this volume. Today, Quebec ranks highest of all regions in Canada in terms of the value of its forest products output. It is very heavily orientated to pulp and paper. BC, which is much more committed to wood products, is second: followed by Ontario, Atlantic Provinces and Alberta.

Our projections indicate that fibre supply constraints, combined with an initial loss of newsprint capacity as old, uneconomic machines are closed during the 1987-1995 period, will severely constrain growth in Quebec's output value over this period. Nevertheless, as we indicate in this volume and in detail throughout the study, the process of rationalization of existing newsprint and some high cost market pulp capacity in Quebec is an essential precursor to more rapid expansion subsequently in higher value added grades of paper and paperboard.

Our detailed projections (see Volume III) indicate that BC's prospects for expansion are comparatively good, although less orientated to higher value grades. By the mid 1990s we expect BC to surpass Quebec in terms of the total value of its forest products output. Most of this would be in newsprint and publication grade paper expansion on the Coast, with expansion in these grades in the Interior being stronger in the subsequent 1995-2010 period, than earlier. Market and affiliated pulp capacity is projected to decline on the Coast, as much of the Coast's marginal pulp capacity, becomes integrated and converted. Market pulp capacity in the Interior is likely to expand strongly, particularly prior to 1995, with much slower growth subsequently as wood costs rise.

Our projections for Ontario assume that Quebec remains constrained in fibre supply, and the publication paper grade as well as printing paper capacity that otherwise could be produced in Quebec, becomes located instead in Ontario. We further assume that the investment climate in Ontario is conducive to these developments and that the apparent fibre surpluses in Ontario (mainly hardwoods) are realistic. In this sense, the outlook for Ontario and Quebec respectively depends heavily upon what happens in the other provinces. We project very strong growth in freesheet papers in Quebec as well as significant growth in mechanical printing papers.

Additionally, Ontario is well placed to upgrade a substantial portion of its uneconomic newsprint capacity. Market mechanical pulp capacity is likely to expand quickly in the short to medium term, but to become integrated into paper or board making fairly soon afterwards. The same is projected for hardwood chemical pulp, but a decline is expected in dried softwood kraft pulp shipments.

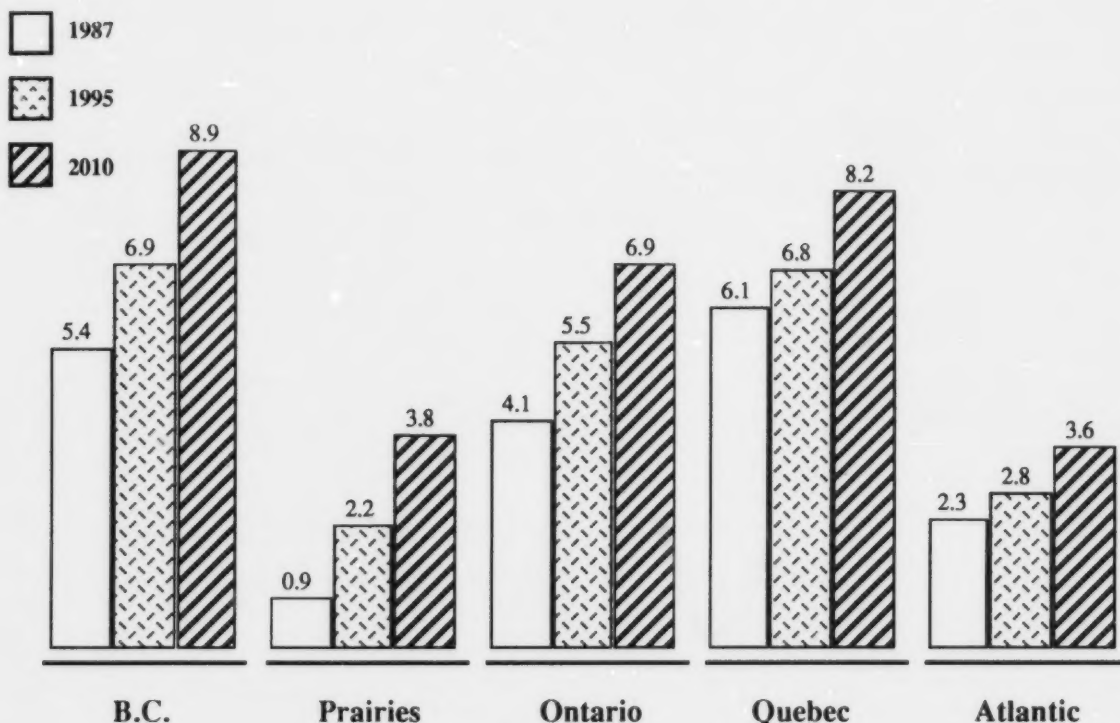
The Atlantic Provinces are likely to see reasonable growth in newsprint, to full state-of-the-art, or elite machines, plus expansion in integrated mechanical and freesheet papers.

Over the longer term, there are good prospects for an expansion of market and affiliated kraft pulps. While there are good quality underutilized mixed hardwood/softwood stands, the average cost is fairly high (i.e. some low cost pockets are available).

The Prairies are likely to continue with the recent outstanding growth in capacity. Specifically, Alberta's aggressive programs to develop a strong papermaking base, over the short term through rapid expansion mainly in pulpmaking, are likely to more than double the region's value of output over the period from 1987 to 1995. Part of this capacity clearly has already been announced, or is underway.

We project that Alberta's rapid expansion in pulp capacity will flow through to papermaking, in part, between 1995 and the Year 2010: however, market pulp will continue to be the backbone of the province's pulp and paper sector for some time to come.

Figure 1-16
Regional Growth Prospects
in the Pulp and Paper Sector
 (billions of 1987 C\$)



In summary, Canada's future engines of growth are potentially healthy and well balanced from province to province. Ontario and Quebec have excellent market-driven prospects to expand in higher value papers and paperboards for the US market. Both face some constraints, Ontario in relation to uncertainty over its fibre supply data and environmental issues, Quebec because of actual fibre constraints. The Atlantic provinces have a number of growth opportunities, particularly in upgrading and integration, although the scale of expansion is likely to be modest because of fibre constraints. The Prairies are well positioned in relation to US markets for pulp, paper and wood products. Coastal BC has a favourable market outlook, but will have to shift towards a greater proportion of higher value-added products. The BC Interior also has good prospects for growth, but this is likely to be preceded by rationalization of its softwood lumber sector, because of the shift in dominant economics away from wood products.

For Western Canada, the recent shift towards greater dependence on the pulp and paper sector will continue. Moreover, prospects in Pacific Rim markets are likely to grow at a faster rate than those in the US. The broad thrust of expansion in eastern Canada, however, will favour the papermaking industry and forward integration.

There is little doubt that Canada is well placed to benefit from future growth opportunities in global forest products trade. Many of the structural changes taking place in the industry worldwide are to its advantage. Even where they may present a disadvantage to some of its traditional products, or to some traditional manufacturing process, these can be offset through better development of alternative process technologies, managerial resources and/or the application of entrepreneurial spirit. Of particular importance will be the relationship between the provinces, as landlords of much of Canada's commercial timberland, and the private sector manufacturing companies.

Forest products is a growth business. It is also a business which is changing. Canada is well placed to respond to these changes and to meeting future opportunities for expansion. Canada has some of the best forest resources in the world. It is located next to one of the largest and growing net importing market areas in the world, the US. On the basis of our market analyses we conclude, with confidence, that the future is not constrained by lack of market opportunities. Nor do we believe that limited physical resources will be the major constraint to growth.

In the 21st Century, Canada's forest sector clearly will no longer enjoy the unique position in world trade that it had historically. The days of being one of a few major export suppliers are past. Gone also are the days when a country such as Canada could simply take a passive role as a supplier, focussing only on production, and the achievement of low unit costs of production, to ensure its competitiveness.

The increasingly competitive conditions which will prevail, and the regional specialization which will occur under liberalized trade globally, are very much in favour of Canada's resource position and manufacturing capability. They will reinforce many of Canada's very progressive policies on resource development. They will support an aggressive shift towards forward integration and higher value-added. Most importantly, they will allow the forest products manufacturing sector to capitalize on its competitive strengths and exploit more fully the process and product technologies in which Canada can achieve excellence.

Even though the future is not constrained by the lack of opportunities, making use of these opportunities will require much more enlightened policies and coordination between the various segments of the industry. The objective will be to achieve a mutual vision in the pursuit of strategies for healthy, balanced growth in Canada's forest sector.

The key resource of tomorrow will be effective and innovative management, both in the public as well as the private sector. We conclude that all forest industry players have to continue with the current shift from mainly production-orientated to predominantly marketing focussed management.

1.6 FORMAT OF VOLUME I ANALYSIS

For the remainder of this section, we will present the reader with an overall view of the balance of Volume I. Volume I, in essence, pulls together the individual product-market analyses and presents the strategic implications of Volumes II-VI. In itself, it is a comprehensive assessment of where Canada's forest industry is today, and the prospects it faces in the future. It is offered as a basis for discussions and policy analysis.

With the background in mind of the major conclusions just outlined, Section 2.0 of this volume makes a detailed assessment of the question: How Well Placed Are We For The Future? We start with a synopsis of the world demand and supply outlook, derived from Volume II of the study. We then look at Canada's potential competitiveness to the Year 2010, drawing extensively from the analyses presented in Volumes II, III and IV. A brief summary of the outlook, by major grade, is provided. In addition, we also look at the supporting factors which are likely to provide the conditions conducive to Canada's future engines of growth into the 21st Century.

In Section 3.0 of this volume we review the prospects for Canada's major regions. The analysis looks at some of the structural changes which have been occurring and examines the potential for expansion of manufacturing capacity and new investment, by major product grade.

Finally, in Section 4.0 of this volume we knit together the main threads of our analyses and discuss, from a national perspective, the major issues and options pertaining to the sector's development over the next twenty years and beyond. We identify four major sets of issues, namely:

1. Investment
2. Technology
3. Market & Trade
4. Resource

A brief synopsis of these issues is presented below: however, the reader also should examine Section 4.0 for a more complete assessment of the various options and issues.

Investment

The magnitude and type of investment in the forest industry will be crucial factors in determining its future performance. The capital-intensive nature of much of the sector puts a very high demand on the cash-flows which it is able to generate. Moreover, because of Canada's predominantly large-volume, low value added commodity focussed product-mix, earnings are highly cyclical.

Today, capital expenditures are occurring at a very buoyant rate. This reflects (a) strong markets and favourable product prices plus (b) a significant amount of structural upgrading and improved competitive positioning. A third, but less significant factor in absolute dollar terms is the upward shift which is occurring towards a higher value added product-mix.

In the investment issues of Section 3.0, we present a forecast of future capital spending requirements based on the assumption that Canada achieves its full growth potential, as identified in this study. We discuss investment related issues such as the historical level of profitability in the sector and past capital spending patterns. We conclude that the magnitude of future investment spending required will far exceed levels which have been achieved historically.

We acknowledge that significant strides have been made by the industry in its capital spending, in terms both of quantity (i.e. very high levels of spending) and in quality (i.e. increased emphasis on processes and products in which Canada's competitive strengths can be maximized). Moreover, we point out that the sector already has considerable forward momentum which, regardless of any additional efforts to optimize future growth, will serve it well in the future.

In other words, left alone, Canada's forest industry will eventually attain many of the growth prospects which it can achieve by virtue of its excellent quality fibre base, its manufacturing skills, the competitiveness of its resource and its locational position in world trade. We also conclude that it could achieve levels of sustainable growth that are beyond our fairly conservative projections and that this would be consistent with regional goals and favourable environmental and resource conditions.

Nevertheless, a number of factors suggest either of these growth scenarios will be difficult to achieve under current conditions and policies. Major additional injections of capital will be required for a significant shift towards a higher value-added product-mix. Historically, Canada's investment climate has not always been conducive to achieving the magnitude and type of capital commitments required for this shift. We express concern over the prospect that the sector could continue to stay locked-in to a relatively low value-added commodity focus. This brings with it the implication of continued dependence on a relatively low value Canadian dollar, in order to maintain competitiveness, rather than emphasis by the industry in moving ahead to improve its competitive position through focus on productivity gains.

The key issue here is the type of investment climate which will prevail in the future. Our analysis of factor-cost trends suggests that Canada's cost competitive position globally is not as favourable as it was some years ago. New, very competitive suppliers are emerging in world forest products trade. Moreover, fibre costs in many regions of Canada are on an upward trend.

Our analysis of recent capital expenditures reveals some conclusions which are of concern.

Although capital expenditures in the industry currently are at record levels, a significant part of the recent investment has been brought about by so-called special factors. These refer to situations where an investment has been made in new or upgraded capacity, but has been driven significantly by either an ownership change (assets purchased at bargain prices) or where significant financial incentives have been provided and/or where new players have entered the industry or have moved beyond their traditional roles. Clearly, there has been sizeable new investment, financed from a base of healthy cash flows, by the established industry. But this has tended to be focussed on a few specific sectors, such as newsprint, and has not been very evident, with a few notable exceptions, in the higher value-added grades. This is discussed more fully in Section 4.0, Issues and Options.

The principal inferences of this conclusion are:

1. Although the desired restructuring of Canada's forest industry is taking place, and capital spending currently is very high, a significant part of the thrust for this has resulted from these special factors. Without them, it is doubtful that the restructuring and capital spending taking place today would be quite so robust.
2. While the types of change outlined above are a normal characteristic of a sector undergoing restructuring, the important point is that these changes in many cases have required the assistance of public funding.
3. The overall climate for investment in Canada's forest industry, based purely on conventional economics, has not been sufficiently favourable to bring about all of the desired level of investment in restructuring and upgrading to higher value added products in particular.

This suggests that federal and provincial governments will have to review very carefully their policies with regard to creating a favourable climate for enhanced capital investment by the private sector. We discuss some of the policy options in Section 4.0 of this volume.

Technology Issues

The Canadian industry's traditional product-mix has been biased technologically to fairly low-value added grades. This was appropriate, at the time, to Canada's resource and trading situation. It also was appropriate to the level of regional economic and resource development in Canada, and to the stage of development of the global industry. Increasingly, Canada's product-mix has been shifting upwards in response to changing economics (e.g. Canada is no longer a low-cost wood area), improvements in technology and rapid development of global trade in forest products.

The economics of the Canadian industry have been, and will continue to be, based on its role as a major volume supplier to international markets. This implies a continuation of the need to have world scale, large, efficient, state-of-the-art production facilities focussed on achieving low costs of production. This is the so-called commodity product role frequently associated with Canada's forest industry.

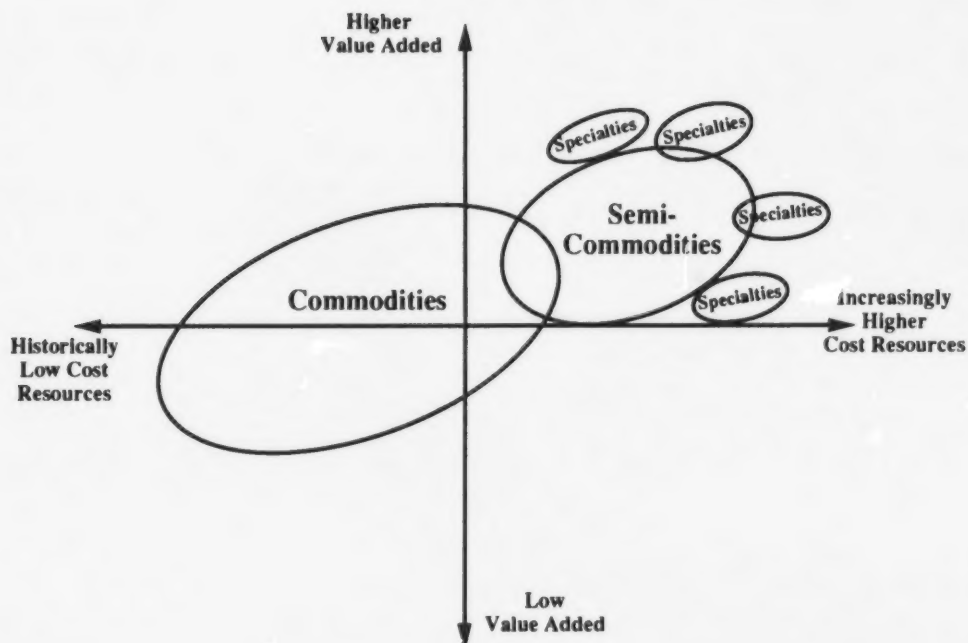
Today, the commodity product label is less appropriate. Technology has been changing. Newsprint, for example, no longer can be regarded as a single homogeneous grade. Increasingly, the output from elite or super mills (see Section 2.0) is of a very high grade, differentiated product. As quality specifications and requirements rise, fewer of these higher priced grades are sold strictly on a price basis.

Nevertheless, we point out in this study that the Canadian industry traditionally has placed fairly strong emphasis on process R&D, and has paid very limited attention to product innovation and aggressive marketing.

Canada can no longer afford to neglect product R&D. We point out that much of the entrepreneurial initiative for new product development (a) has come from outside the forest industry itself and (b) that new and smaller companies, rather than the large integrated companies in Canada, have been the most active and influential in upgrading the product-mix.

In this sense, much of the industry traditionally has become locked-in to relatively low value commodities and has depended on low cost resources (i.e. the lower left portion of Figure 1-17).

Figure 1-17



The thesis that we present in the study is that Canada's manufacturing industry needs to take a much more aggressive role in technological leadership internationally in those products and processes in which Canada has unique strengths and a potentially very strong competitive position. We point out however the one of the drawbacks is that Canada lacks a significant multiplier effect within its economy to support the adoption by manufacturing companies of new technologies. There are significant costs and a high degree of risk involved. The policy implications are discussed in Section 4.0.

In essence, the policy direction can be summarized as in Figure 1-18. In order to achieve the growth opportunities identified in this report, the investment climate has to facilitate innovation so the goal would be to ensure that Canada's forest products companies will expand the role of specialties and semi-commodities, yet still retain the economic advantages of large scale, low unit costs of production for the overall product-mix.

Figure 1-18

- Expand specialties into semi-commodities through emphasis on Product R & D
- Expand semi-commodities into commodities through emphasis on Product and Process R & D
- Continue to find better and less expensive ways to produce

Market & Trade Issues

The shifts in the economics of the Canadian forest industry, frequently referred to in this volume, have a number of causes. We already have referred to the expansion of global supply, to the rise in resource costs in Canada and to the development of new competing products challenging Canada's traditional product-mix. Another very important factor has been the general trend of growing liberalization of trade worldwide, partially offset in important consuming areas of the world by the emergence of strong trading blocs, such as the European Economic Community (EEC).

Another of the important conclusions of this study is that it is in Canada's interests to have free and unfettered access to all world markets if its full potential and competitive strengths in forest product exports are to be maximized. Access to world markets is essential for Canada's large volume commodity grades, as well as in semi-commodities. For specialties, free access to the North American market should suffice. We conclude, however, that there are a number of market and trade related constraints which may limit the extent to which the sector achieves its growth potential. Foremost among these, are the tariff and non-tariff barriers which exist in many of Canada's current and potential export markets such as Japan (e.g. on S-P-F lumber) and the European Economic Community (e.g. on newsprint).

Notwithstanding the prospects of better access to the US market as a result of the Canada-US Free Trade Agreement, there are constraints to achieving an improved market share in the US. These constraints are more subtle than trade barriers. They relate to Canada's own efforts, or in many cases lack of effort, in aggressive marketing. In comparison with many competitors, Canada's market intelligence network, utilizing official trade channels, has considerable potential for improvements. In Section 4.0 we discuss some of the policy issues. In particular, we conclude that in view of the magnitude of the export prospects, export assistance programs should be reviewed critically.

Resource Issues

In this study, we have attempted to place Canada's fibre supply situation in a context which is appropriate to long range, strategic planning. In Volume V, we conclude that realistically there are some fibre constraints regionally. In a few isolated cases these are becoming critical. Nevertheless, we believe that, for Canada as a whole, it is wrong for analysts of the industry to continue to send the message that "Canada is running out of wood".

We point out, for example, that technological changes in manufacturing offer a considerable amount of scope for overcoming apparent resource constraints. While this also shifts the economics of production in some cases, or requires significant new fixed capital injections in other cases, we believe that growth in market demand supports the majority of these initiatives by the industry.

Taking lessons from history, we point out that other areas, such as the Nordic countries, faced with similar problems have indeed managed to overcome many of their constraints. The emphasis here is on the word management. We conclude that increasingly, the technological response will have to be the route also for Canada.

The argument that "Canada is running out of wood" has been used, simplistically, as a proxy for justifying higher levels of replanting and better levels of forest management. In themselves these are valid goals. Nevertheless, it is no longer appropriate to justify them, we believe, on the basis of the argument that unless these planting and intensive forest management programs are undertaken that the manufacturing sector will not be able to respond to market opportunities in the future. The two issues are not inextricably bound together. Moreover, doing so, in our view, can have serious negative impacts on Canada's investment climate and on corporate attitudes to new investment in the sector.

We point out that, as landlords of most of Canada's commercial timber, the provinces have an important, and increasingly influential role, in determining the shape and form of the sector's growth in the future. We give credit to the provinces for progressive policies towards improved utilization. Nevertheless, we conclude that in view of the magnitude of future export market opportunities for the sector, the provinces must expand their vision of the potential. Specifically, provincial policies to facilitate major private sector investment, based on what essentially is a publicly owned forest land resource, require that the investment climate must remain healthy and competitive with alternatives throughout the world.



SECTION 2.0
ARE WE WELL PLACED FOR THE FUTURE?

2.1 WORLD DEMAND AND SUPPLY OUTLOOK

- 2.1.1 Methodology and Assumptions
- 2.1.2 Paper and Paperboard
- 2.1.3 Market Pulp
- 2.1.4 Wood Products

2.2 COMPETITIVENESS OF CANADA'S INDUSTRY TO THE YEAR 2010

- 2.2.1 Methodology and Assumptions
- 2.2.2 Fundamental Cost Competitiveness
 - Softwood Fibre
 - Hardwood Fibre
 - Labour
 - Energy
 - Delivery
- 2.2.3 Factors Determining Overall Competitiveness
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- 2.2.5 Market Pulps
- 2.2.6 Softwood Lumber
- 2.2.7 Woodfree Paper
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2.3 SUPPORTING FACTORS

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- 2.3.4 Technological Trends

2.1 WORLD DEMAND AND SUPPLY OUTLOOK

2.1.1 Methodology and Assumptions

In recent years there have been a large number of studies and projections of the global or regional demand and supply outlook for forest products. The existence of these studies provides an opportunity to make a comparison of their respective assumptions and conclusions.

We reviewed these studies and projections in the expectation that they would help us develop a credible scenario of likely developments over the next ten to twenty years in demand and supply of forest products. There are obvious advantages in developing a scenario which incorporates most of the recognized forecasts readily available to industry. In the event, this expectation proved to be misplaced. Although they each contain much valuable data, the various forecasts, in our view, are not sufficiently accurate in their entirety to be used for the purposes of this study. Volume II provides the details of this conclusion.

Subsequently, we developed what we hope will be considered a credible scenario for the purposes of this study. This is based on the WRA database, and also incorporates many of the better features of the well known public forecasts such as FAO/Chase and ETTS IV and private sector forecasts such as Resource Information Systems Inc. (RISI) with regard to the global and regional projections of demand and supply.

At the outset of the study, we also sought to ensure that WRA's credible scenario projections provided in Volume II would be acceptable to the Canadian industry, as a basis for the subsequent analyses which we wished to carry out (and which are provided in Volumes III-V). With the cooperation of Canadian Forestry Service, selected forest product companies in Canada and trade associations, we invited representatives from the industry to work with us to review our projections. The objective was to pre-screen the projections to ensure that, while the organizations or individual representatives might not fully endorse them, they would be considered reasonable and credible.

The methodology we followed was to develop a demand-driven set of projections globally and regionally for the major categories of forest products. This is a fairly standard approach. It is based on detailed examination of consumption patterns and trends. Details for each grade pertinent to Canada are provided in Volumes II-IV. The pre-screening method was designed to ensure that realistic assumptions were made of the impacts of factors such as technological changes in products and processes, economic growth, per capita consumption levels and rates of substitution between competing grades.

We also examined supply prospects comprising assumptions about industrial fibre supply, paper finish composition, trade patterns and restrictions, tariffs and non-tariff barrier, transportation logistics and exchange rates. These are detailed in Volume II.

Early in the study we identified some fibre supply constraints, particularly on a regional basis. Although our overall conclusion is that globally there is no shortage of fibre as such, we relied heavily on existing inventory data and related analyses. These indicate that, based on current forest management practices, it is realistic to anticipate some fibre supply constraints. These are incorporated in our analyses and are discussed in Sections 3.0 and 4.0 of this Volume.

It is important to note, therefore, that the regional scenarios developed for Canada, and its prospects in exports markets, are fibre-constrained based on existing provincial inventory data available in Canada. Thus, for example, our world demand scenario identifies expansion opportunities for the BC Coast lumber industry, based on its competitive position in trade to the Year 2010, which are unlikely to be met because of a shortage of incremental economic sawlogs of the quality required.

Clearly, fibre supply is responsive to price changes to varying degrees depending on the region. Moreover, from the product perspective of the example above, increased use of finger-jointing technologies, as one possibility, could utilize material such as short lengths not traditionally or widely used by the industry. We have outlined our assumptions on fibre costs in Volume V. The various levels of technological substitution between products and processes are discussed in the sections relevant to each grade in Volumes III and IV.

In summary, Section 2.1 will outline our projections of global and regional demand for forest products to the Year 2010. This is an unconstrained scenario in the sense that it can be considered to be realistic from a demand perspective.

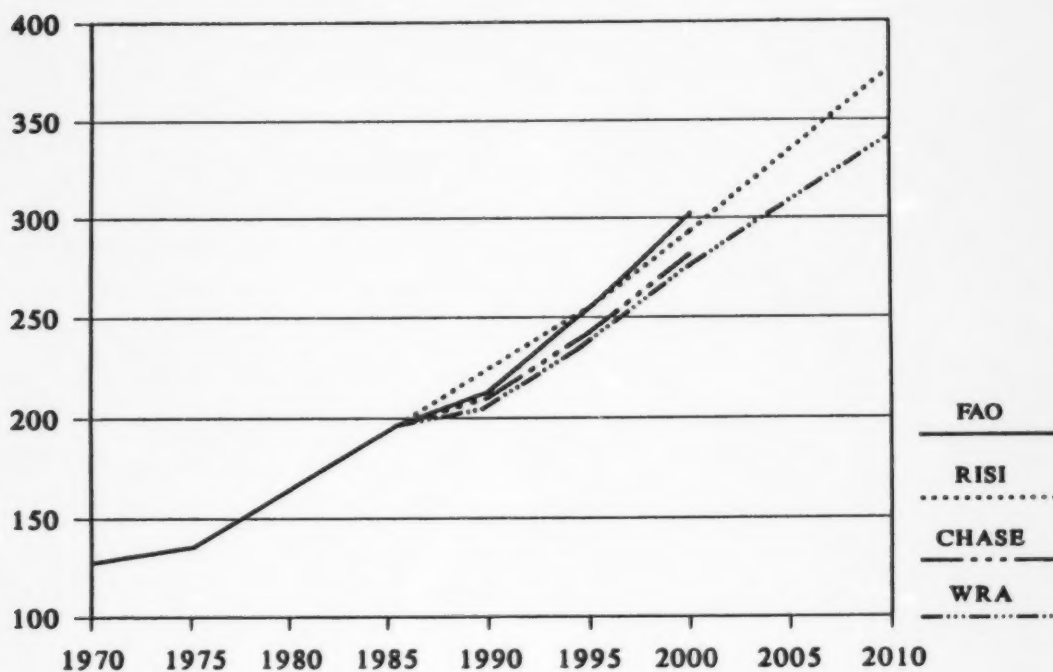
In Section 2.2 we discuss Canada's supply and market share prospects. We incorporate currently known fibre constraints into these demand projections as far as Canadian supply is concerned, where these constraints are believed to be relevant. The remainder of the section (Sections 2.3 and 2.4) assesses how well Canada is placed to meet this demand in terms of its industrial structure and manufacturing base. We also examine the supporting factors which are likely to put Canada, and its various regions, in a good position to achieve the fibre-constrained growth potential identified in Section 2.2. These factors include Canada's excellent resources of comparatively low cost power, the high quality of much of its fibre, technological trends which favour Canada and the recent Canada-US Free Trade initiative.

Finally, we should note that there are many potential growth impediments even under the fibre-constrained assumptions. They include a wide variety of factors such as the existence of a poor climate for investment in any given region and so on. These are the subject of a special analysis in Section 4.0 of this volume, and have obvious implications for government and industry policies regarding investment in Canada's forest industry.

2.1.2 Paper and Paperboard

The credible scenario developed in this study indicates that world demand for paper and paperboard is expected to increase by almost 150 million tonnes over the 1985-2010 period (Figure 2-1), with an annual growth rate averaging 2.3%. Details of this forecast are provided, by major product grouping, in Volume III.

Figure 2-1
World Paper and Paperboard Consumption
History and Forecast
1970 - 2010
(millions of tonnes)



Source: WRA

In addition, Table 2-1 presents a summary of the projected trends of consumption by major region.

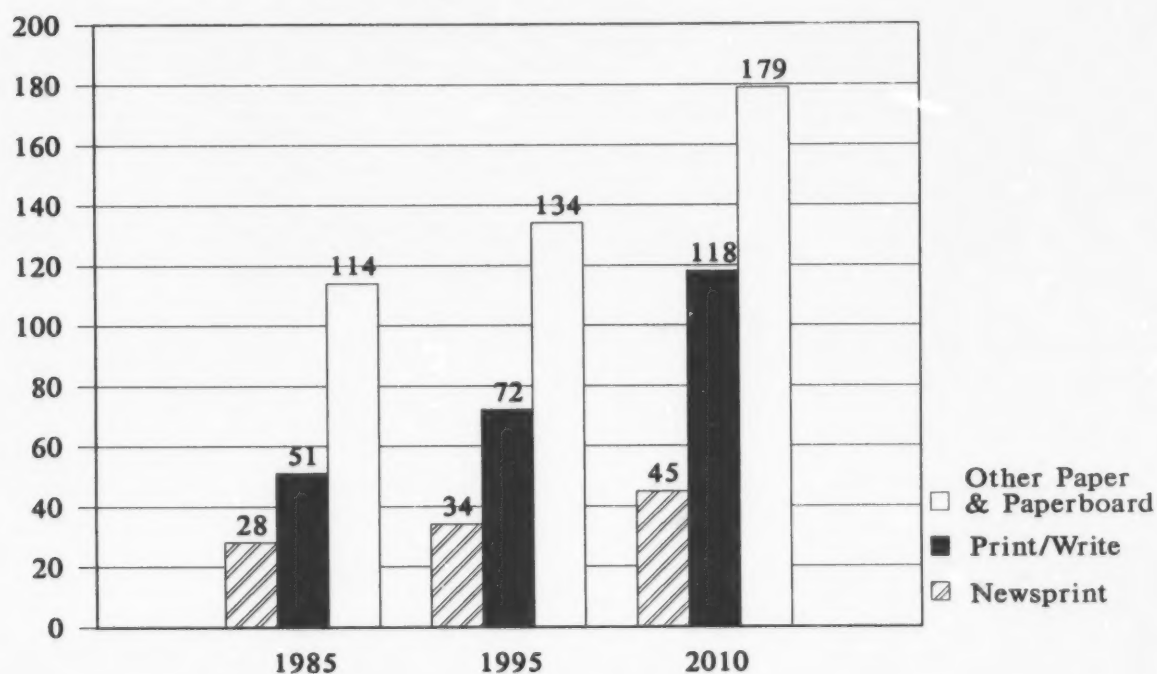
Table 2-1
Current and Projected Apparent Consumption
of Paper and Paperboard by Region
(millions of tonnes)

	1985	1995	2010	Volume Change		Annual Growth (%)	
				1985-1995	1995-2010	1985-1995	1995-2010
North America	73.1	86.0	114.4	12.9	28.4	1.6	1.9
Canada	5.2	6.0	6.9	0.8	2.2	1.4	.9
US	67.9	80.0	106.5	12.1	26.2	1.7	1.9
Western Europe	46.4	56.3	74.6	9.9	18.3	2.0	1.9
Nordic	3.7	4.7	6.2	1.0	1.5	2.4	1.9
Others	42.7	51.6	68.4	8.9	16.8	1.9	1.9
Latin America	10.4	15.2	30.3	4.8	15.1	3.9	4.7
Brazil	3.7	5.8	12.9	2.1	7.1	4.6	5.5
Chile	0.3	0.5	1.2	0.2	0.7	5.2	6.0
Others	6.4	8.9	16.2	2.5	7.3	3.3	4.1
Asia-Pacific	30.8	41.4	61.8	10.6	20.4	3.0	2.9
Japan	20.3	26.0	38.1	5.7	12.1	2.5	2.6
Dev. Oceania	2.9	3.3	4.9	0.4	1.6	1.3	2.7
Others	7.6	12.1	18.8	4.5	6.7	4.8	3.0
Africa and Middle East	4.7	5.6	7.6	0.9	2.0	1.7	2.1
Centrally Planned	27.2	35.5	53.3	8.3	17.8	2.7	2.7
USSR	9.7	12.0	15.8	2.3	3.8	2.2	1.9
Eastern Europe	5.9	7.3	9.6	1.4	2.3	2.2	1.8
China	11.4	15.9	27.3	4.5	11.4	3.4	3.7
Other C.P. Asia	0.2	0.3	0.6	0.1	0.3	4.1	4.7
World Total	192.6	240.0	342.0	47.4	102.0	2.3	2.4

Source: WRA

Although the growth outlook scenario to the year 2010 anticipates overall growth averaging 2.3% per annum over the period 1985 - 2010, it is expected that newsprint will increase at a 1.9% rate while printing and writing grades will continue at a more rapid 3.4% rate. The 'other paper and paperboard' category is expected to show a more modest 1.8% growth rate. Details of these projections again are provided in the relevant sections of Volume III.

Figure 2-2
World Paper and Paperboard Consumption
By Product 1985 - 2010
 (millions of tonnes)



Source: WRA

Table 2-2
World Paper and Paperboard Consumption and Growth Rate
By Product 1985-2010
 (millions of tonnes)

	1985	2010	Annual Growth (%) ¹
Newsprint	28.1	45.4	1.9
Printing and Writing	51.4	118	3.4
Other paper and paperboard	113.1	178.6	1.8
Total	192.6	342.4	2.3

¹ Compound annual average

Source: WRA

It is relevant to note that most of the increase in paper and paperboard consumption will occur in the "Big 3" market areas of (1) North America (2) Western Europe and (3) Japan. In total, these areas are projected to account for an increase of over 87 million tonnes or 58% of the total increment of consumption between 1985 and the year 2010. Moreover, over the period 1985 to 1995, these combined areas should account for over 60% of the total projected increment.

Even though annual growth rates are higher in developing market areas (for example, Latin America) the sheer size of the major developed markets continues to make them dominant well into the 21st century. Thus the US alone is projected to account for over one-quarter of the total paper and paperboard consumption increment over the period.

New suppliers, however, will increase in number and in their impact on world market share and trading patterns, particularly to the year 2010. Many of these will be based on low-cost plantation timber (Figure 2-3). The capability of new and developing supply areas to produce higher value added is not limited by technological factors or capability. Nevertheless, there will be practical limitations, pertaining to investment, logistics and market access, which will tend to produce a bias for new suppliers towards the production of lower priced commodity grades of paper and paperboards and market pulps.

Figure 2-3
World Outlook to Year 2010

- Most of the increase in paper and paperboard consumption will occur in the 'Big 3' market areas:

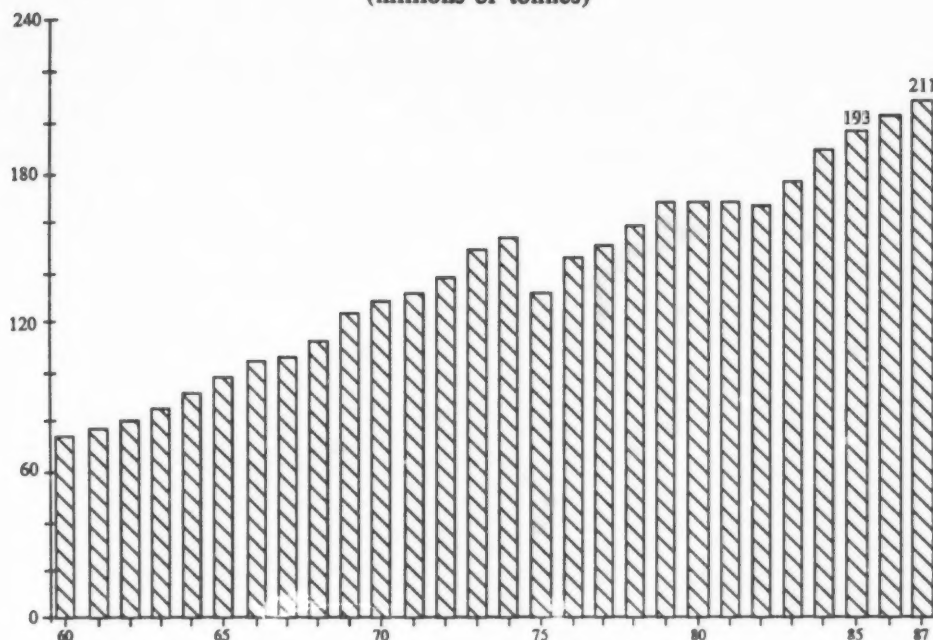
North America	41.3
Western Europe	28.2
Japan	<u>17.8</u>
	<u>87.3</u>

Total World 149.4 million tonnes (1985-2010)

- But new suppliers will increase
- Many based on low-cost plantations
- Producing lower value added commodity grades

Although the projected increment of world consumption in the WRA forecast might appear large, it is lower than many current projections over the same period. We believe it to be a conservative prediction of future growth and have selected this as the most appropriate basis for preparing an unexaggerated or credible view of the market outlook for the purposes of this study. As Figure 2-4 shows, world production of paper and paperboard has been remarkably stable over the past few decades. Annual consumption levels have varied more widely, but on average closely mirrors the production data shown. The strong impact of the 1975-1977 world recession is clearly visible, as indeed is the impact of the recession in the early 1980s.

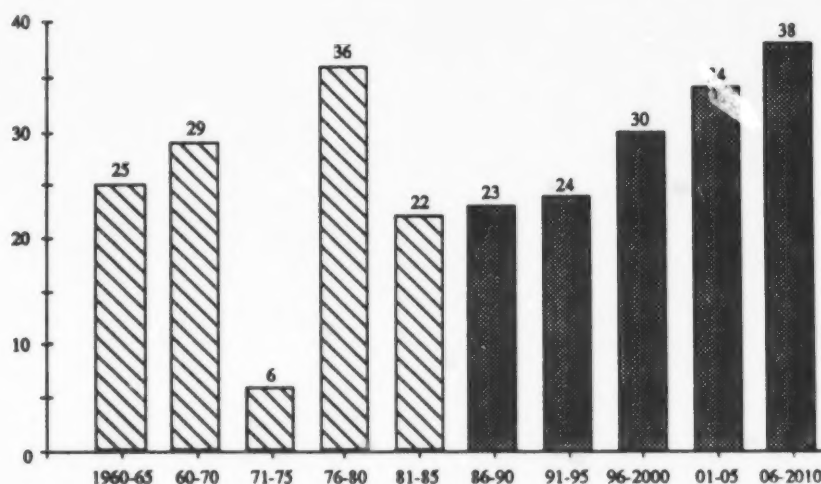
Figure 2-4
World Paper and Board Production
Remarkably Stable
 (millions of tonnes)



Source: WRA

The projections we present should be considered as indicative of the longer term trends. Recent history has shown that cycles of paper and paperboard demand can be characterized by significant variations from year to year. Nevertheless, over a period they tend to fit to an overall trend. Figure 2-5 compares the history of actual experience with our projections to the year 2010. The data are five-year average increments of growth. They varied over the period 1960-1980 from an increment of only 6 million tonnes in 1971-75 on average, to a 36 million tonne increment in the following five-year period (1976-1980). In this context, we consider the short term projected increments of 23 million tonnes (1986-1990) and 24 million tonnes (1991-1995) to be conservative, but achievable in view of the average 30 million tonne five-year increment projected over the whole forecast period.

Figure 2-5
Five-Year Increments in World Consumption of Paper and Board
1960-2010
 (millions of tonnes)



Source: WRA

2.1.3 Market Pulp

Our projection indicates that there will be a very large increase in pulp production over the period. In Volume III we present details of these projections, and summarize them in the following figures. In 1986, global demand of around 203 million tonnes required 137 million tonnes of paper grade pulp (Figure 2-6). This represented two-thirds of the total furnish used. The balance was 29% recycled fibre coatings and fillers, and around 3% was non-wood fibres. By the year 2010, over 215 million tonnes of paper grade pulp will be required even though recycled fibre (plus coatings, fillers, etc.) will increase in overall significance. This increment of 78 million tonnes of virgin pulp represents nearly a 60% increase over 1986 pulp demand, globally. In Volume III, we discuss the implication of this projection in some detail. We point out, for example, that market pulp producers will continue to remain significant even though integrated and affiliated pulp and paper operations will increase in importance (Figure 2-7).

Figure 2-6
Huge Expansion in Paper & Paperboard Demand Globally
...will Require a Large Increase in Pulp Production
 203 Million Tonnes 342 Million Tonnes

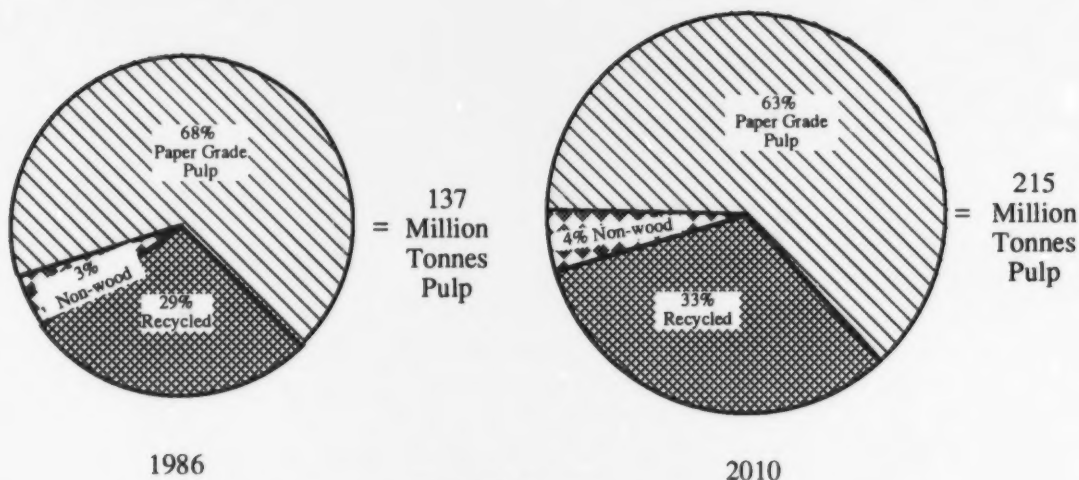
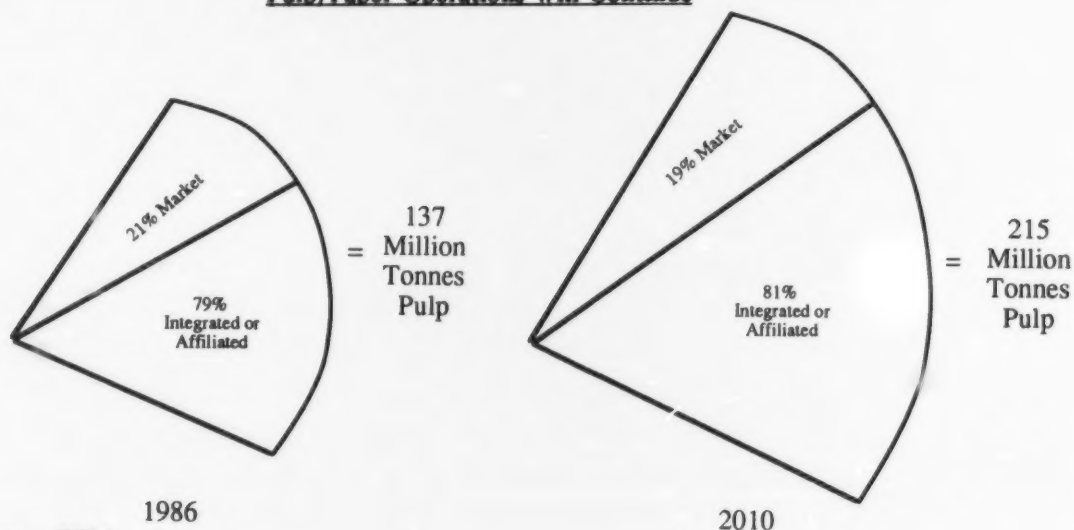


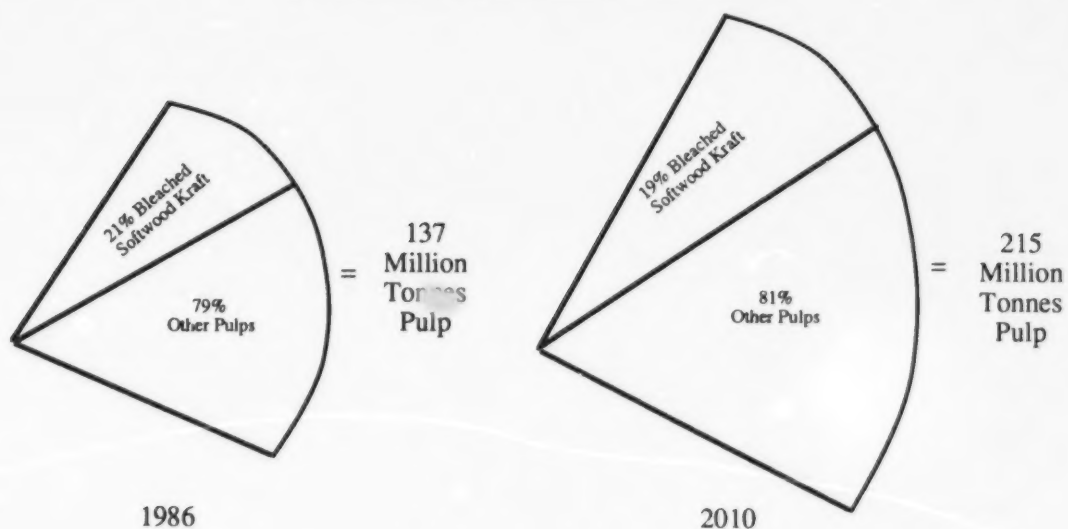
Figure 2-7
The Trend Towards Increased Integrated & Affiliated
Pulp/Paper Operations Will Continue



Source: WRA

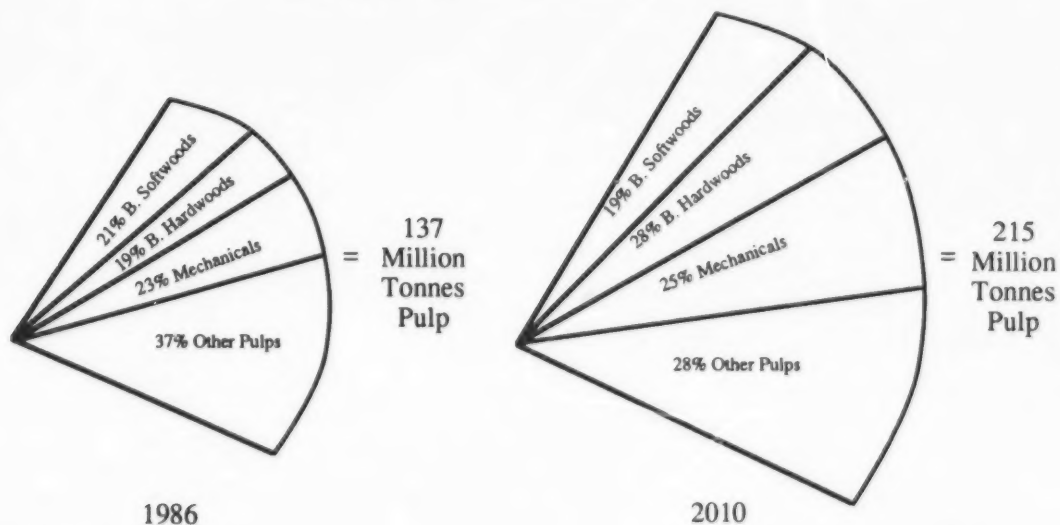
Of particular importance to Canada, bleached softwood kraft pulp (market, affiliated and integrated) will gradually lose market share over the longer term, but bleached hardwood kraft and mechanical pulps will increase in importance at the expense of softwood kraft and the more significantly declining grades, such as unbleached kraft and sulphite (Figure 2-8).

Figure 2-8
Bleached Softwood Kraft Will Gradually Lose
Market Share Over the Longer Term



Source: WRA

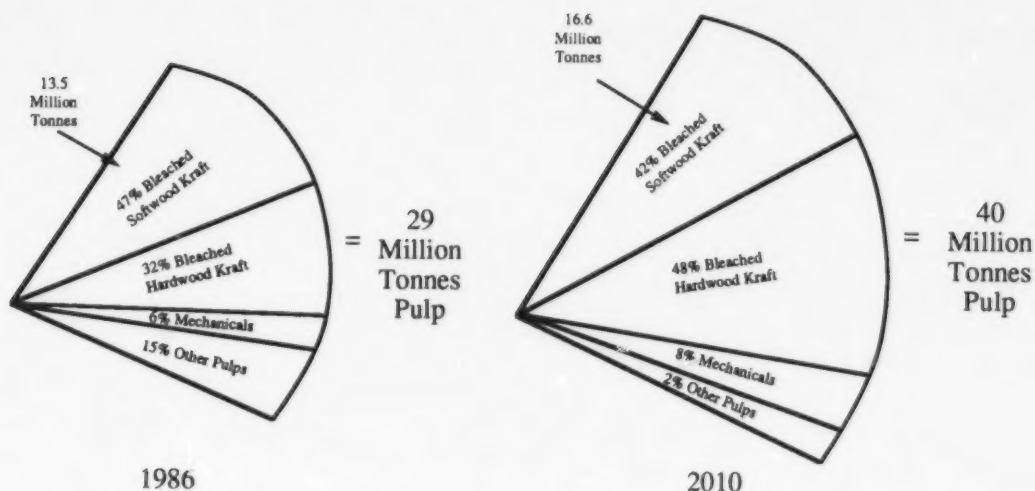
Figure 2-9
Whereas Bleached Hardwoods and Mechanical Pulp Will Gain
Market Share From Declining Grades



Source: WRA

In market pulps, absolute demand for bleached softwood kraft will increase, from 13.5 million tonnes in 1986 to 16.6 million tonnes by the year 2010, but it will lose market share to bleached hardwood kraft and mechanical pulp grades (Figure 2-10).

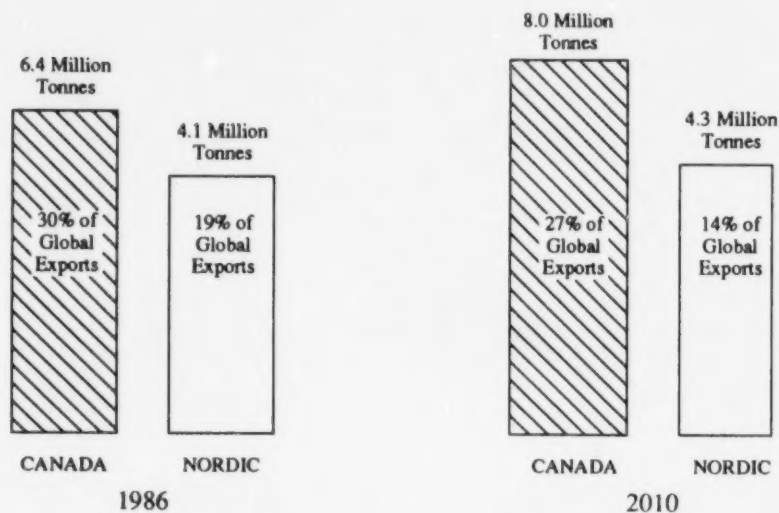
Figure 2-10
In Market Pulps, Demand for Bleached Softwood Kraft Will
Increase But It Will Lose Market Share to Bleached
Hardwood Kraft and Mechanicals



Source: WRA

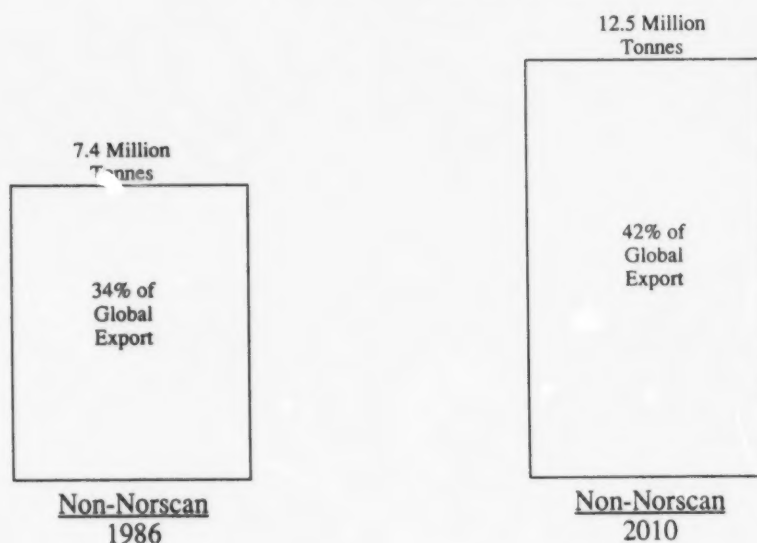
Also, of key interest to Canadian market pulp producers, our forecast anticipates that Canada and Nordic countries will export more pulps in volume terms (Figure 2-11), but will lose market share to Non-Norscan producers (Figure 2-12).

Figure 2-11
Canada and Nordic Countries Will Export More Pulp,
But Will Lose Market Share ...



Source: WRA

Figure 2-12
To Non-Norscan Producers



Source: WRA

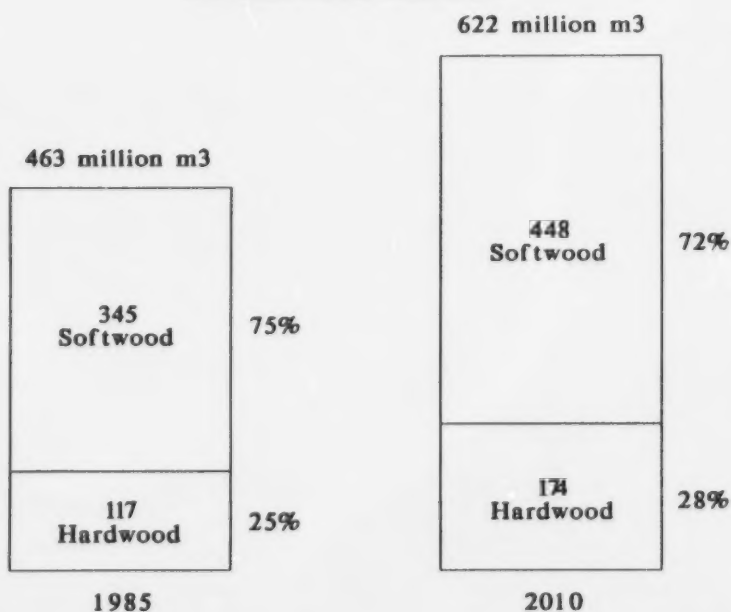
In volume terms, Canada's exports of pulp are projected to increase from 6.4 million tonnes in 1986 to 8.0 million tonnes by the year 2010, compared with a very modest increase forecast from Nordic countries. Non-Norscan producers, on the other hand, are likely to increase their total exports of pulp from 7.4 million tonnes, or 34% of global exports in 1986, to 12.5 million tonnes or around 42% of global exports by the year 2010.

2.1.4 Wood Products

Lumber

In Volume IV, we present our detailed analysis of the outlook for Canada's wood products sector. The global demand outlook is summarized below. In 1985, lumber production totalled 463 million m³, comprising 75% softwood and 25% hardwood. By the Year 2010, we expect a production increase to around 622 million m³, or an increase of about one-third, in volume terms. We also expect that hardwood lumber will increase in importance from 25% of the total in 1985 to 28% by the Year 2010.

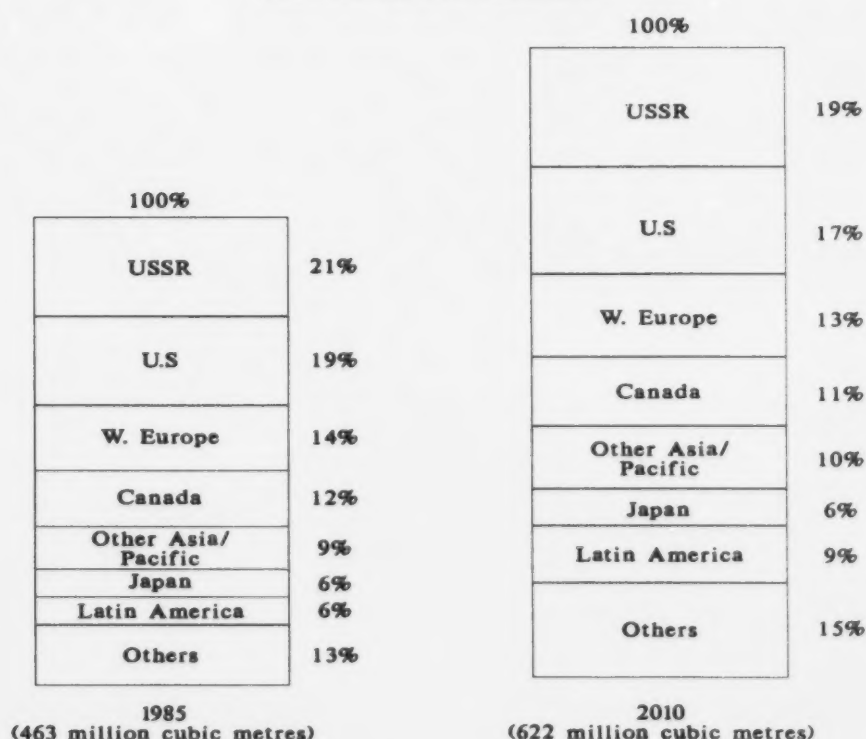
Figure 2-13
Summary Lumber By Type



Source: WRA

In 1985, Canada had a 12% share of total world production and we see this holding fairly consistently to the year 2010. In large part, this will be due to Canada's very strong competitive position in softwood lumber production. Our projections indicate increased output of lumber in the US (Figure 2-14), but a decline in the US market share. Based on the assumption that imported sawlogs will continue to be available, we predict that lumber output in Japan will increase in volume terms, but stay fairly constant as a proportion of the global total. Declines are expected in the relative shares of the USSR and Western Europe while Latin America, Asia-Pacific and others will continue to grow in importance.

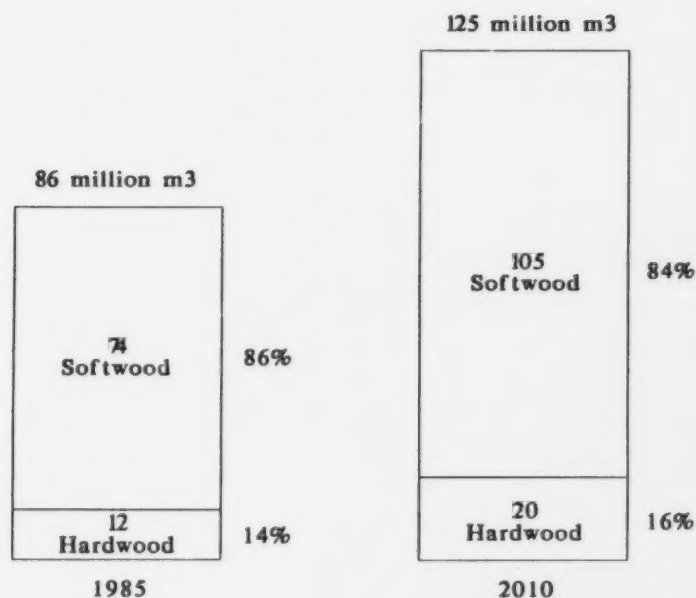
Figure 2-14
Regional % Share
of World Lumber Production



Source: WRA

Lumber trade is expected to expand over the coming decades from its 1985 base of 86 million m³ to around 125 million m³ by the year 2010. Again, hardwood trade will increase in absolute importance (Figure 2-15).

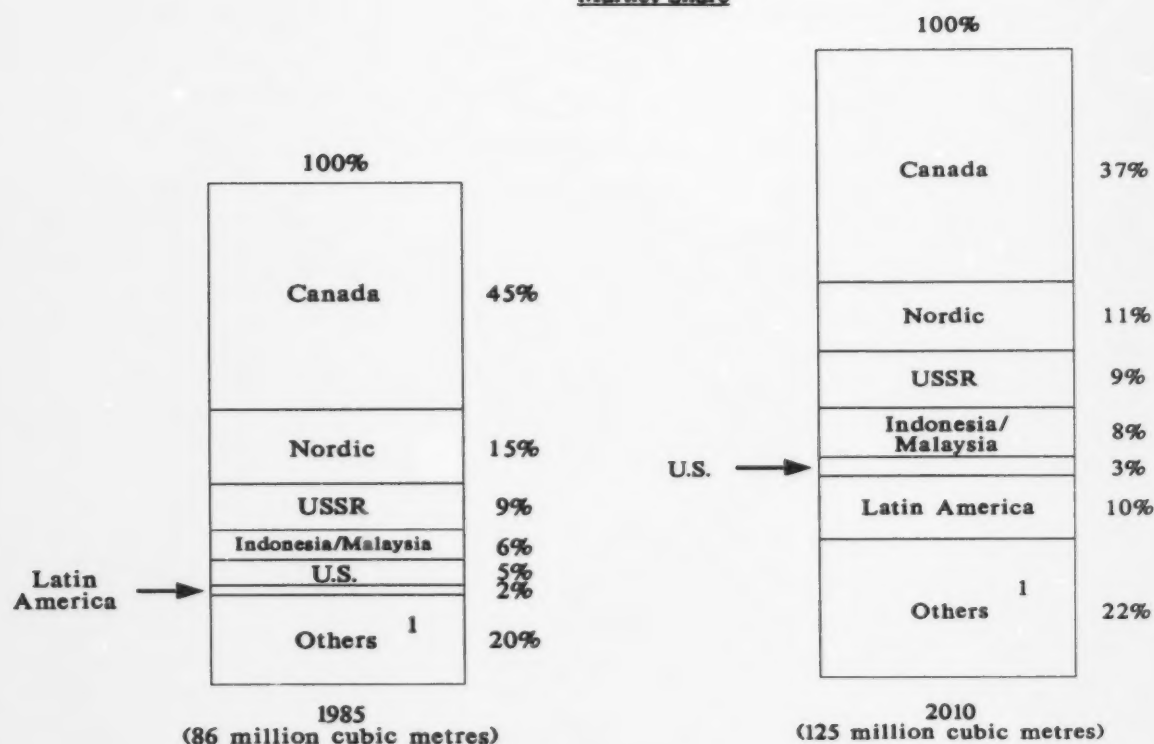
Figure 2-15
Lumber Trade By Type



Source: WRA

This is reflected in the significant expansion of export market share projected for Latin America (from 2% in 1985 to 10% by the year 2010) and other emerging areas. Canada's share of global lumber exports is expected to decline from 45% in 1985 to 37% by the year 2010, even though its export volume will increase. Nordic countries face a comparable situation (Figure 2-16).

Figure 2-16
Lumber Trade % Export
Market Share



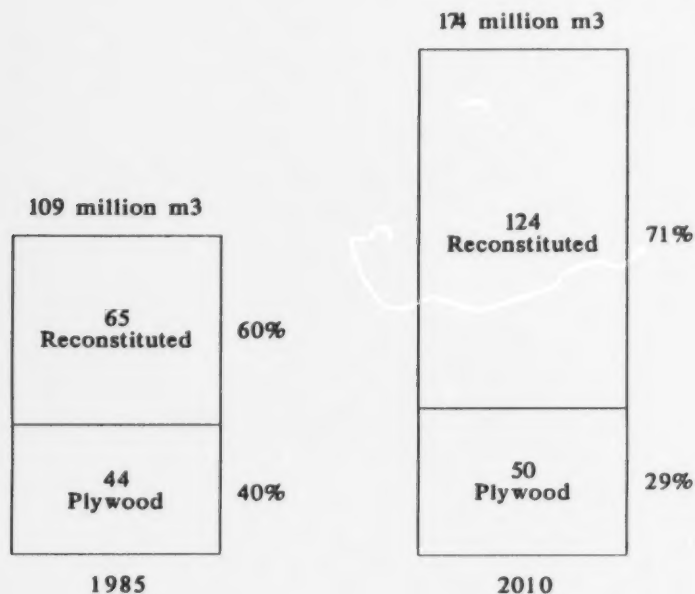
¹ Others includes internal trade between countries within regions (e.g. Austria to Italy)

Source: WRA

Panelboard Production

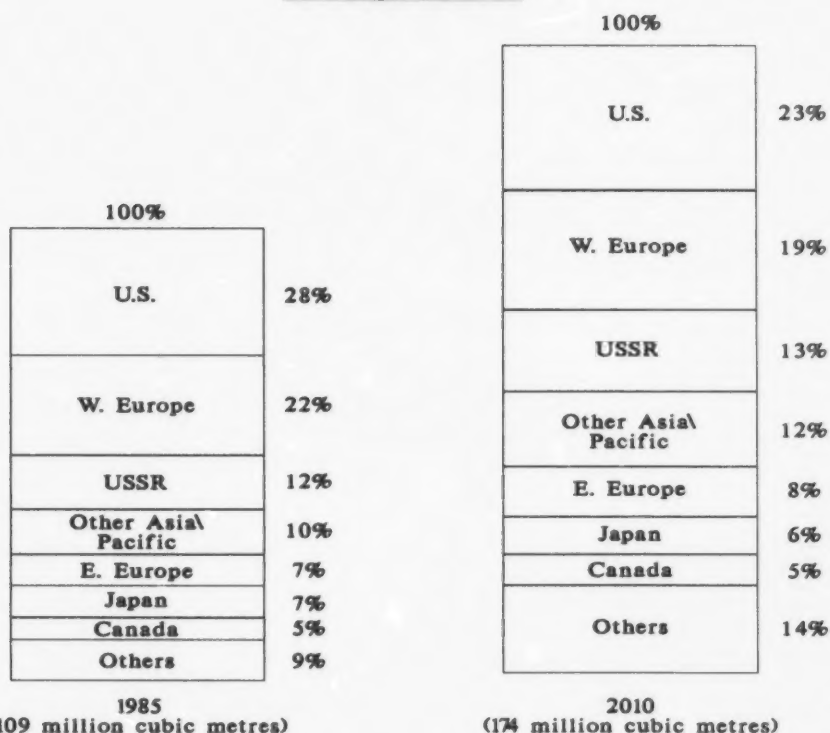
In Volume IV, we also present our detailed analysis of panelboards, comprising all reconstituted board as well as plywoods. From a base volume of 109 million m³ in 1985, our projections indicate a global production increment of 65 million m³, or nearly 60% over the 1985 level. This is considerably stronger growth than the one-third increase projected for lumber over the same period. Although plywoods, notably hardwood plywoods, are expected to increase in volume, the major growth is expected to occur in reconstituted boards (Figure 2-17).

Figure 2-17
Panelboard Production By Type



Canada's share of global panelboard output is expected to remain constant (Figure 2-18) primarily because of its capability in waferboard/OSB and MDF. From a fibre supply and technology point of view, Canada has a number of competitive factors in its favour. These include its fibre base and the strength of its established market position and distribution system. Nevertheless, as we point out in Volume IV, achievement of its potential will require increased initiatives by Canadian panelboard producers in (a) increasingly sophisticated distribution systems and (b) downstream integration.

Figure 2-18
Panelboard % Share
Of World Production

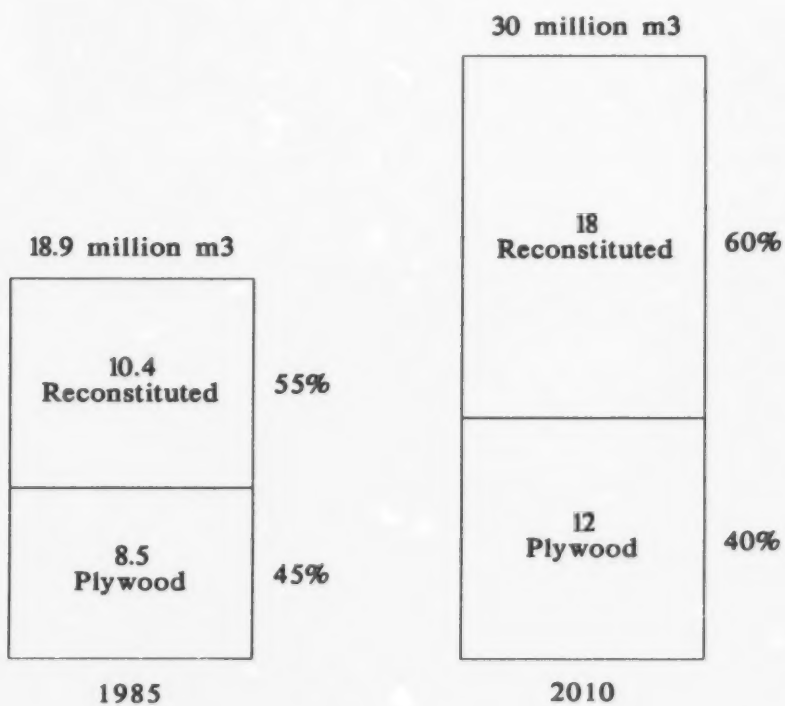


Source: WRA

The US, which today dominates total panelboard production, is not likely to retain its very large share (28% in 1985) of global production, but will remain as a very sizeable and growing producer. US producers are better placed than their Canadian counterparts to exploit the potential of downstream integration.

In global terms, plywood is expected to lose share of total trade as reconstituted boards increase in importance and availability (Figure 2-19).

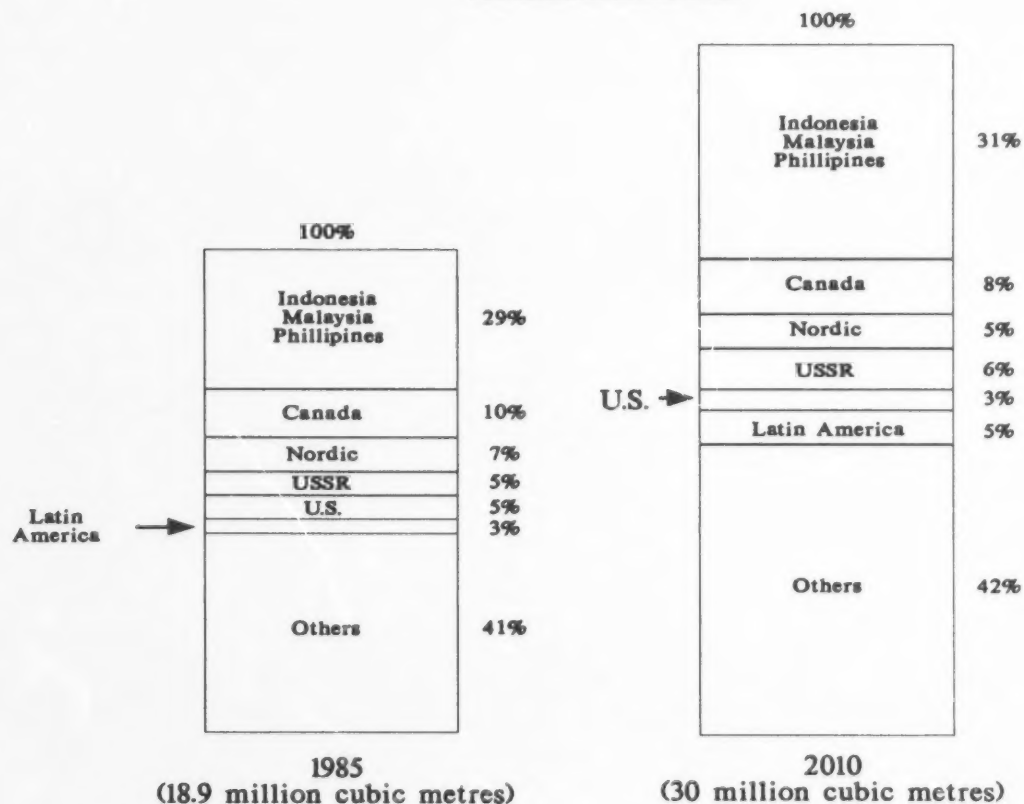
Figure 2-19
Panelboard Trade By Type



Source: WRA

The significance of Canada, the Nordic countries and the US will decline in relative terms, but increase in volume terms, as tropical timber supply areas dominate even more than they do today (Figure 2-20).

Figure 2-20
Panelboard Trade
% Export Market Share



Source: WRA

2.2 COMPETITIVENESS OF CANADA'S INDUSTRY TO THE YEAR 2010

2.2.1 Methodology and Assumptions

A large number of factors influence the competitiveness of a sawmill, pulp mill, paper machine, company, region or country. These include the fundamental cost factors, such as wood, labour, purchased energy and delivery. They also include product quality and service factors. In higher value added products, factors such as reliability of supply, consistency of product quality and others related to them frequently are important or even crucial in determining competitiveness. In this sense, there is an element of risk or cost to the purchaser if he buys simply on price alone. Few purchasers of higher valued products do so, and many sellers of commodity grades seek to differentiate their products from those of other producers in this way.

Consideration of fundamental costs, on a comparative basis, nevertheless, is a useful broad indicator of potential comparative advantage in trade. Clearly, overall competitiveness is determined by the aggregate impact of a wide range of factors, which vary widely between mills, companies, regions and countries. Moreover, the history and current practice in the development of forest industries in many parts of the world, show clearly that non-market factors frequently play a major role in achieving cost competitiveness of domestic capacity.

In recent years, the positive impacts of multi-lateral trade agreements, such as the various rounds of GATT, together with bi-lateral agreements, have done a great deal to produce a level playing field. This has facilitated progress in achieving regional specialization based on fundamental cost factors. Nevertheless, the playing field still is far from level in many respects and is unlikely ever to be completely level as long as forestry and forest industries development globally are used as tools for economic and social progress. This applies not just to developing countries but to many underutilized timber areas in developed countries, including Western Europe, the United States and Canada.

With these qualifications in mind, it is still important in a long range strategic study of this type to assess the likely shifts in product-mix of various areas. Moreover, it is important as a basis for predicting where a region or country's comparative advantages lie in trade, domestically and in export markets.

Correspondingly, in this study we provide a two-part global analysis of competitiveness in the pulp and paper sector regionally, in terms of:

1. Fundamental cost competitiveness,
2. Overall competitiveness (i.e. taking other factors into account).

We also present in this section our assessment of the overall competitiveness of Canada as a major producer and exporter of softwood lumber.

2.2.2 Fundamental Cost Competitiveness

The major part of this analysis is presented in Volume VI. For the major products of interest to Canada, the Volume VI analysis reviews the current cost position of various regions of Canada with those of other existing and potential producing areas. It also projects cost trends in order to assess the likely regional position in 1995 and the year 2010. This is not a definitive or necessarily a short-run analysis: rather, it is intended as an indicator of the most likely longer term competitive scenario. It assumes, for example, that current (i.e. mid 1988) exchange rates will prevail over the longer term whereas recent experience shows that, over the shorter term, wide variations are typical.

Four key fundamental cost factors have been selected in the Volume VI comparative analysis. They are:

1. Virgin fibre
2. Labour
3. Purchased energy
4. Delivery

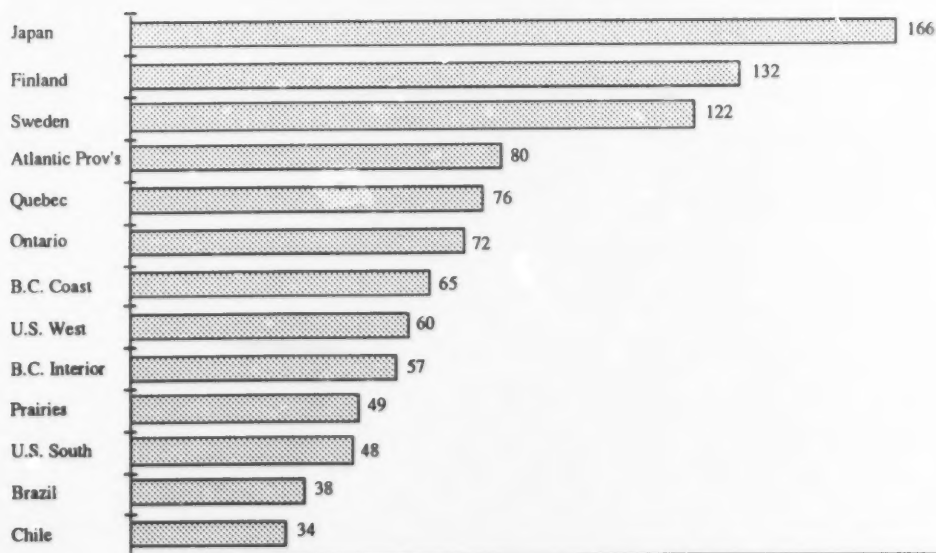
The conclusions of the analysis are summarized below.

Softwood Fibre Costs

The Volume VI analysis is based on current and projected virgin fibre costs. Recycled fibre is considered as an important, but not a crucial determinant of cost competitiveness in the major grades of paper of concern to Canada. It is not taken into account in the Volume VI analysis. Overall fibre costs represent a large proportion, frequently around 40%, of total manufacturing costs. Consequently, comparative costs of fibre per tonne of product are a major indicator of cost competitiveness. The impact of differences in fibre quality and process technology are discussed later in this section.

Average softwood fibre costs in 1987 for selected areas are summarized in Figure 2-21. Chile and Brazil clearly have a considerable cost advantage over all other areas. Moreover, this is expected to continue (Figure 2-22). Correspondingly, their patterns of industrial development in forest products are likely to be fibre intensive e.g. kraft pulping, kraft papermaking. Nevertheless, although they have very significant potential, the current impact of these areas in world trade is limited by their slow pace of new capacity growth. Canada, the US and the Nordic area have a much greater volume impact, particularly in softwoods.

Figure 2-21
1987 Softwood Fibre Costs
(US\$/BDMT)



Source: Volume VI

Within the traditional supply areas, the US South, the Prairies and the BC Interior are the most cost competitive in softwood fibre. Overall, Canada is far more cost competitive than are Sweden, Finland and Japan. Eastern Canada is a fairly high cost region in terms of softwood fibre costs in comparison with the US.

The projections (Volume VI) show that future inflation in fibre costs will affect the various areas differently. These figures are based on pulpwood (and subsequent figures refer to pulp and paper) but similar relationships are apparent for sawlogs (and wood products). By the Year 2010, the rankings compared with 1987, would be as shown in Figure 2-22. Chile and Brazil (whose wood costs have a very low or zero component for recovery of infrastructural and stand maintenance costs) will retain their superior cost position, and probably will be joined in this league by other new supply areas which currently are developing softwood plantations. We expect that plantations will continue to be established and used for social and general economic development. Thus, wood costs for a large group of emerging suppliers may not be equivalent to what foresters in, for example, New Zealand, Sweden, the US or Canada would regard as representing full cost recovery.

A large group of average cost producers will exist. In particular, the BC Interior, Prairies, US South, Iberia and US Inland Empire areas will lose their current better than average cost advantage. Ontario, Quebec, the BC Coast and the Atlantic Provinces will remain as high cost areas for softwood fibre.

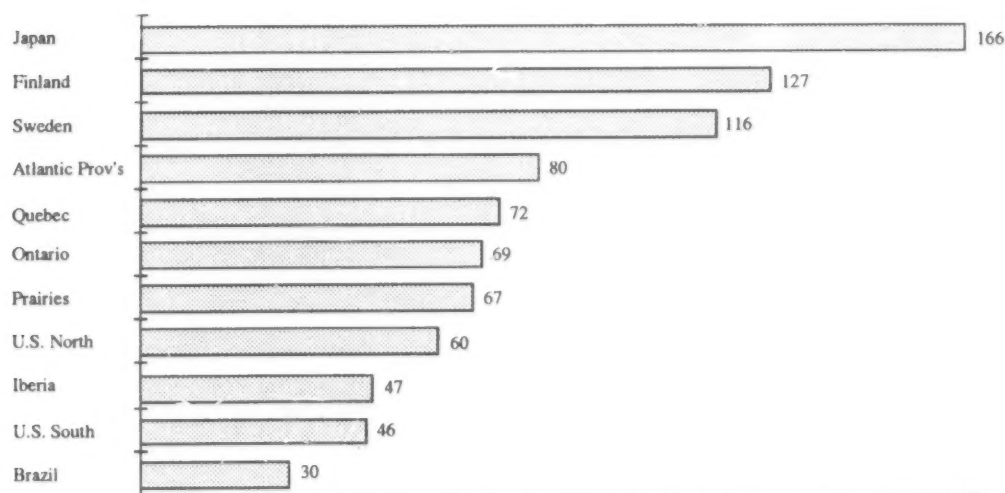
Figure 2-22
Year 2010 vs 1987: Softwood Fibre Costs
(Ranked Basis 1-10)

	Low Cost (1-4)	Average (5-7)	High Cost (7-10)
<u>1987</u>	Chile Brazil U.S. South Prairies Inland Empire Iberia	B.C. Interior U.S. West Coast B.C. Coast New Zealand U.S. North Ontario	Quebec Atlantic Prov's Sweden Finland Japan
<u>2010</u>	Chile Brazil U.S. South Other	Prairies Inland Empire B.C. Interior U.S. West Coast Iberia New Zealand U.S. North	B.C. Coast Ontario Quebec Atlantic Prov's Sweden Finland Japan

Hardwood Fibre Costs

In hardwoods, Brazil's excellent high quality and uniform, low cost plantation eucalyptus fibre is by far the most competitive globally (Figure 2-23). There are other areas with similar fibre costs, e.g. Argentina and Chile, but as far as significant commercially developed hardwood fibre supply is concerned, Brazil currently is in the best competitive position. Iberia and the US South are broadly comparable in fibre costs, although Iberia's advantage is in plantation low density eucalyptus compared with predominately medium to high density mixed hardwoods in the South.

Figure 2-23
1987: Hardwood Fibre Costs
(US\$/BDMT)



Source: Volume VI

The Prairies in Canada and the US North and West have costs in the US\$60-67/BDMT range, but can be considered low cost producers on a global basis. Nevertheless, again there are significant differences in the value for papermaking purposes of the fibre from these areas. Prairie aspen, for example, is fairly highly valued as a low density hardwood.

The Volume VI projections indicate that current rankings are likely to shift over the period to the year 2010 (Figure 2-24). By that time, of those in the current group, only Brazil and Chile will remain as low cost producers on the basis of the rankings used. All regions of Canada, including Alberta's low cost but potentially high valued aspen, will be in the average cost group. The high cost group, comprising Sweden, Finland and Japan, will remain fairly much as they are today.

Figure 2-24
Year 2010 vs 1987: Hardwood Fibre Costs
(Ranked Basis 1-10)

	Low Cost (1-4)	Average (5-7)	High Cost (7-10)
<u>1987</u>	Chile Brazil U.S. Iberia Prairies	Ontario Quebec Atlantic Prov's	Sweden Finland Japan
<u>2010</u>	Chile Brazil	Iberia U.S. (All Regions) Canada (All Regions)	Sweden Finland Japan

Source: Volume VI

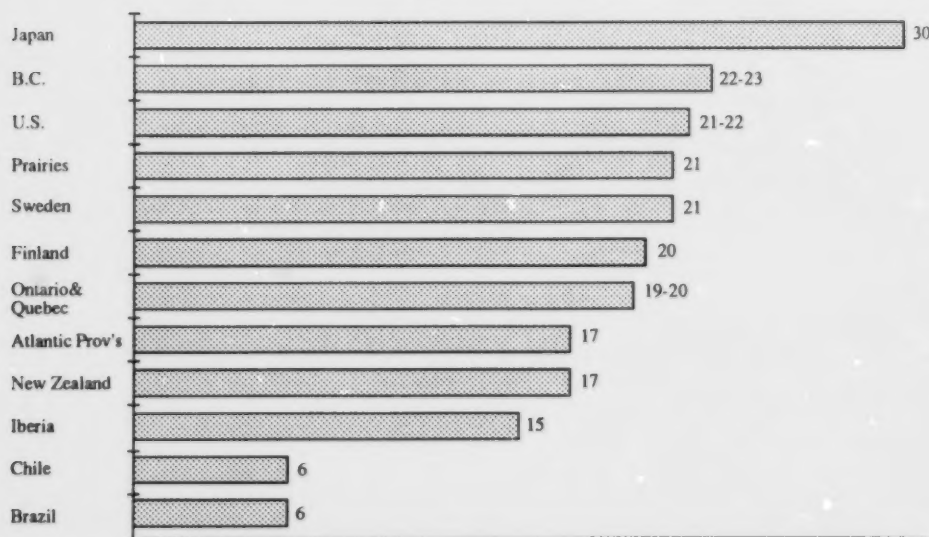
In reality, plantation developments taking place, or currently planned, are likely to have an impact on this list of rankings by the year 2010. In particular, it is probable that additional low cost timber growing areas in the tropical and sub-tropical regions will emerge as new suppliers. In these areas, rotation ages for pulpwood are as low as 7-10 years, similar to those of Brazil today. Moreover, from a pulp and papermaking perspective many of the plantation grown species, such as the various Brazilian eucalyptus varieties, have outstanding potential because of the uniformity of their fibres. This uniformity, contrasts with the wide variability of species and ages which is typical of the supply at many Canadian pulp mills. Uniformity in fibre supply has an economic advantage and makes the job of high quality pulpmaking much easier.

Labour Costs

Unit costs of labour are at best only a very general indication of comparative costs. They are subject to a multitude of qualifications, such as the effect of labour productivity and the capital intensity of the process technology in question. Even within very developed supply areas and mature products, such as Sweden, Finland and Canada in newsprint, there are significant differences in labour productivity. Moreover, differences in labour codes and practice, overhead and social costs render direct unit cost comparisons somewhat limited in value for the purposes of this study. Over the longer term, in any case, unit labour costs tend to average themselves out. Twenty years ago, Japan was a low cost labour country. Today, it is very high cost. Japan's productivity gains, on the other hand, are a matter of worldwide renown.

Even with these types of qualifications in mind, it is clear that Chile and Brazil have a significant cost advantage over others in the group (Figure 2-25). Moreover, there are many other developing areas of the world in the same or a similar low cost of labour situation.

Figure 2-25
1987: Labour Costs
(US\$/hr. worked)



Source: Volume VI

Over the period to the year 2010, low labour cost areas such as New Zealand are expected to revert to the average cost group, to join all of Canada (except the Atlantic Provinces) and the US, both of which are in the average cost group today. Today, only Japan is in the high cost grouping, but Sweden and Finland are likely to join this group by the year 2010 (Figure 2-26).

Figure 2-26
Year 2010 vs 1987: Labour Costs
(Ranked Basis 1-10)

	Low Cost (1-4)	Average (5-7)	High Cost (7-10)
1987	Brazil Chile Iberia New Zealand Atlantic Prov's	Canada (except Atlantic Prov's) Finland Sweden U.S.	Japan
2010	Brazil Chile Iberia Atlantic Prov's	New Zealand Canada (except Atlantic Prov's) U.S.	Finland Sweden Japan

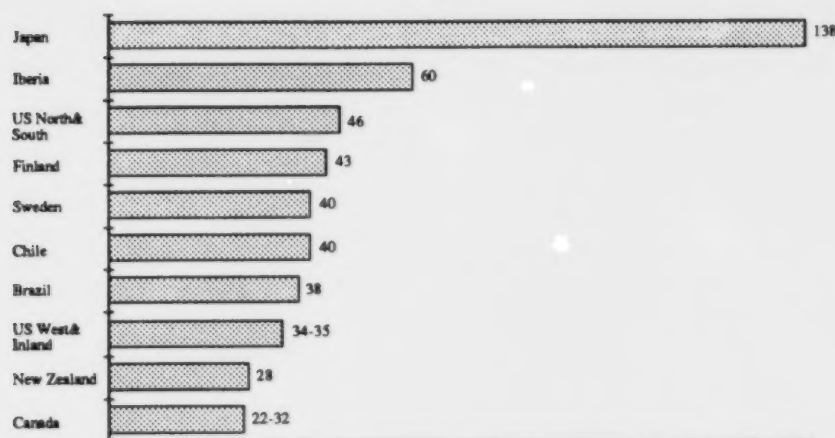
Source: Volume VI

Energy Costs (also see Section 2.3.2)

In contrast to labour costs, purchased energy costs are significantly different between the various producing areas. Moreover, as OPEC I and OPEC II demonstrated, international energy markets can have a dramatic impact on any given region's competitiveness and have a strong influence on the process technology that it uses. Moreover, the magnitude of investment required for any increase in capacity can rise significantly if energy self-sufficiency of the mill is defined as a priority, even though this provides the security of insulation from sharp rises in purchased energy costs.

Canada has a clear advantage in the availability of low cost power (Figure 2-27). Within Canada, Quebec, Alberta and BC are highly competitive but even the highest cost provinces are competitive on a world scale.

Figure 2-27
1987: Energy Costs
(US\$/MWH)



Source: Volume VI

New Zealand and some parts of the US West and Inland area also are competitive. Most of the rest of the US, however, is in the average grouping, except for the US South which (except for isolated examples discussed in Section 2.3.2) is a high cost area for purchased power. Moreover, this area's fibre resources (pine) use between 15-25% more energy per tonne for many grades of mechanical pulp/paper. In specific areas of the US, however, co-generation potential exists for low cost power. Nevertheless, the disparity in favour of Canada is expected to prevail over the next 20 years and beyond (Figure 2-28). Clearly, this has important implications for Canada in terms of the types of power intensive technologies in which it is likely to have a comparative advantage in trade with the US. This is discussed elsewhere in this study.

Interestingly, the analysis underlying the Volume VI projections indicates that power system developments in Brazil and Chile will result in an improvement in the competitive position of these regions over the next twenty years or so.

Figure 2-28
Year 2010 vs 1987: Energy Costs
 (Ranked Basis 1-10)

	Low Cost (1-4)	Average (5-7)	High Cost (7-10)
<u>1987</u>	Canada - All Regions New Zealand	US - All Regions Brazil Chile Sweden Finland	Iberia Japan
<u>2010</u>	Brazil Chile Canada - All Regions, except Atlantic Prov's New Zealand	Atlantic Prov's Inland Empire US West	US South Iberia Japan Sweden Finland US North

Source: Volume VI

Delivery Costs

Delivery to market is another of the fundamental costs to be considered on a comparative basis. Differences in these costs can be the crucial deciding factor when comparing the competitiveness of various supply areas, one against the other.

In the accompanying figures, average delivery costs from major supply areas is provided to specific destinations; namely, to the US Atlantic, to Europe and to Japan. Examination of delivery costs to the US Atlantic region (Figure 2-29) shows that most supplying regions of Canada, except BC, are broadly cost competitive with US suppliers. All regions of BC along with Chile are in the average cost grouping, while Japan and New Zealand are not competitive to this market in delivery costs, as might be expected.

Figure 2-29
1987 Delivery Costs
(US \$/ADMT)

<u>To US Atlantic</u>		
\$41 - 50	\$51 - 60	\$62 - 79
All US All Canada - except BC	BC Coast BC Interior Chile Brazil Finland Sweden Iberia	Japan New Zealand

Source: Volume VI

In comparative terms, most of Canada and the US is about average in delivery costs to Western Europe (Figure 2-30) while the BC Interior, Prairies and New Zealand are in the high cost grouping.

To Japan, on the other hand (Figure 2-31) much of the US is very competitive in delivery costs and only the BC Coast can compare. Most of Canada, with the exception of the Atlantic Provinces and BC Coast is in the high cost grouping. This tends to penalize mills in the BC Interior and Prairies, particularly against US West (low cost), Inland Empire (average cost) and New Zealand (average cost) suppliers.

Figure 2-30
1987 Delivery Costs
 (US \$/ADMT)

<u>To Europe</u>		
\$24 - 41	\$42 - 62	\$63 - 79
Iberia Sweden Finland	All U.S. All Canada - except BC Interior & Prairies Brazil Chile	BC Interior & Prairies Japan New Zealand

Source: Volume VI

Figure 2-31
1987 Delivery Costs
 (US \$/ADMT)

<u>To Japan</u>		
\$41 - 50	\$51 - 60	\$61 - 71
US West BC Coast US North US South	Inland Empire Atlantic Prov's New Zealand	All Canada - except BC Coast & Atlantic Prov's Iberia Sweden Finland Brazil Chile

Source: Volume VI

2.2.3 **Factors Determining Overall Competitiveness**

As noted earlier, this is determined by the aggregate impact of a wide range of factors. They include:

- * Fundamental cost factors (4 key cost components were discussed above)
- * Depreciation and financial charges
- * Other investment factors
- * Technology, quality and service
- * Integration synergies and economies of scale

Depreciation and Financing Changes

The capital costs of sawmills, pulp and paper mills vary between regions, even for essentially the same technologies. In part, this can be attributed to differences in type of raw material used, differences in site conditions, the degree to which support processes, such as chlor-alkali plants in pulp mills are required if purchased chemical supplies are not available, and so on. There are further differences when total investment costs are considered. Financing charges attributable to a specific product depend on various factors such as financing structure, interest charges, etc. So, even on a purely market basis, typically there will be wide variations in cost competitiveness due to differences in depreciation, financing charges and related factors. Moreover, in many cases, there are factors which modify competitiveness. They can modify positively, in the sense that the unit depreciation and financing charges per tonne are reduced. Examples include investment tax credits, incentive or soft loans, and reductions in capital costs (capital items absorbed by others or financial risks assumed by others).

Other factors can modify negatively. This is the case where, for example, new infrastructural requirements are made (access roads for public use) or where environmental regulations are changed and where these costs are borne by specific mills and facilities.

It also is worthwhile observing that the average competitiveness of a region or mill can be modified when an existing asset changes ownership at a discount or at a premium. Over the past few years, in Canada and elsewhere, assets have been sold at what currently could be considered bargain basement prices. Where this occurs, it can have a very positive impact on competitiveness but tends to be a unique occurrence as far as given facilities are concerned.

Other Investment Factors

Experience also shows that the marketplace can influence investment in a product in a specific region where there is no apparent comparative advantage, or where the advantage is only beginning to emerge. In recent years, for example, currency factors have had a modifying influence in this regard. The cost of an offshore investment in the purchaser's currency (e.g. Yen vs. Dollar) may be considerably lower than the cost in the vendor's currency. As indicated in Section 4.2.2, this is one of many special factors which underlie the current boom in capital spending in Canada's forest products industry.

Another factor which can influence an investment decision is the desire to establish a strategic market position in a given area. Canadian companies have established strategic market positions, for example, in the European newsprint industry and in paperboard. Usually, fundamental cost factors support these investments but low cost acquisitions and other factors may also be involved.

While these factors are not really a measure of the long term competitiveness of a region or country, they are valid investment considerations and have the effect of modifying the pattern of regional specialization which would tend to emerge if only the key fundamental factors were taken into account.

Technology, Quality and Service

The process technology utilized in a mill or region can, and does, have a major impact on overall competitiveness. It can modify a comparative disadvantage in the fundamental cost factors. Moreover, emphasis on product quality and service are becoming increasingly important as producers seek to differentiate their products from those of their competitors.

Today, various high cost regions are pursuing these strategies with considerable success. Quality differentials, such as consistently high brightness and uniform opacity in newsprint (e.g. USA Today standards) frequently achieve only a modest price premium but offer the advantage of guaranteed volume purchases to the producers of these grades. As in most other industries, service to customers also is becoming an increasingly crucial factor in determining cost competitiveness.

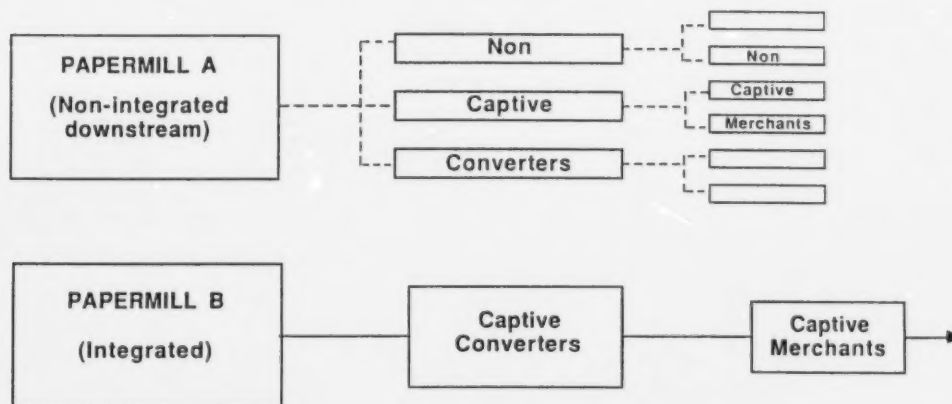
Integration Synergies and Economies of Scale

Analyses of fundamental costs frequently ignore the benefits of integration and economies of scale. There are various advantages in this respect and both can have a determining impact on overall competitiveness. Moreover, so-called external economies, such as an established site, an established position as a producer, also have an influence on investments. In some cases, companies will achieve an acceptable overall level of profitability by capturing profits or value added downstream. In the US, for example, some linerboard mills capture profitability in their boxboard plants rather than at the papermaking end. This is often one of the essential reasons for such integration (Figure 2-32).

Economies of scale have been major feature in the development of Canada's forest products industry. They will continue to be a major influence in the future because of Canada's position as an export supplier in competitive global markets. Nevertheless, they involve a trade-off: namely, they result in a bias towards commodity-grade business and investment culture. Often it is difficult to change this culture. As a result, for Canada and other supply regions of the world, this factor can have a significant modifying influence on their overall competitiveness in a specific grade. In particular, excessive emphasis on production volume and low unit costs of production can result in a low-priority on quality leadership, service and technological advances. Certainly, this has been the history of many grades of paper and paperboard in Canada over the past decade, but appears to be undergoing an improvement in the current cycle.

Earlier, we discussed, in general terms, the current quality of the capital asset base in Canada's forest products industry. In the remainder of this section a more detailed evaluation is provided, by some major grades. As a broad indication of Canada's competitiveness, global-scale rankings have been made for the period to 2010 and predictions have been made of likely investment trends in Canadian capacity.

Figure 2-32
In Many Higher Value Added Products,
The Paper Mill's Profit is made
Through Integration Downstream



..... Thus, volume-sales can be assured

..... But Downstream Captives frequently are price-takers and are captives of the papermill's culture

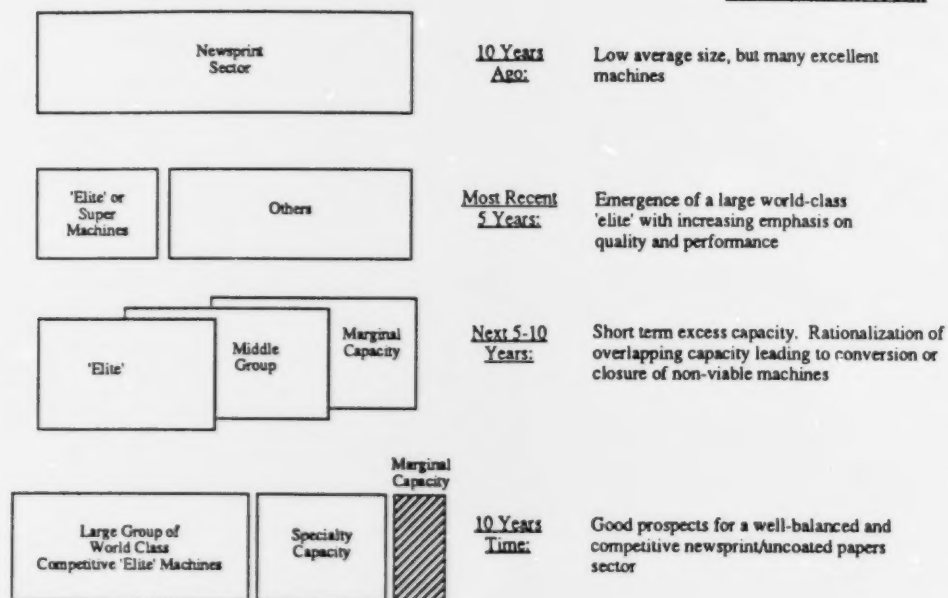
2.2.4 Newsprint

There is considerable and, in our view, justifiable concern in the industry today about the short term outlook for newsprint prices, beyond the 1988 level of buoyant markets and a fairly balanced supply-demand position. Much of this concern centres on the very large increase which has occurred in newsprint capacity globally, as well as within Canada. Nevertheless, as we show in Volume III, the medium to longer term demand outlook clearly justifies increased capacity. The real point at issue should be whether or not the timing of recent and planned new capacity is prudent.

In general, the quality of recent investments in newsprint has been very high. It is no longer appropriate to refer to the newsprint sector as such. Rather, two or three newsprint sectors are emerging in Canada as far as global cost and quality competitiveness over 20 years are concerned (Figure 2-33). Moreover, it is no longer appropriate to refer to newsprint as a commodity in the sense that the word implies large volumes of non-differentiated product. Few consumers of newsprint are willing to substitute one supply source for another simply on the basis of a price differential. Instead, a spectrum of newsprint grades has emerged.

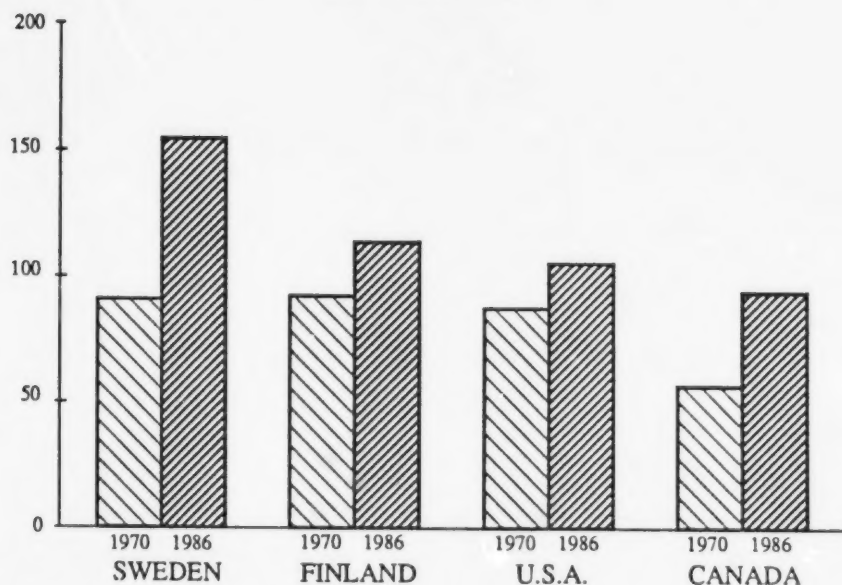
Figure 2-33
Canada's Winning Strategy in Newsprint & Mechanical Pulp Based Uncoated Papers

Note: Schematic Not To Scale



Ten years ago, however, it was appropriate to refer to a single newsprint sector in Canada as far as machine operating cost and quality performance were concerned. Recent analyses have indicated that, on the average, Canada's newsprint machine capacity is low by world standards. This statistic is true, but misleading. On a global comparison, Canada's average capacity per machine appears to be low (Figure 2-34).

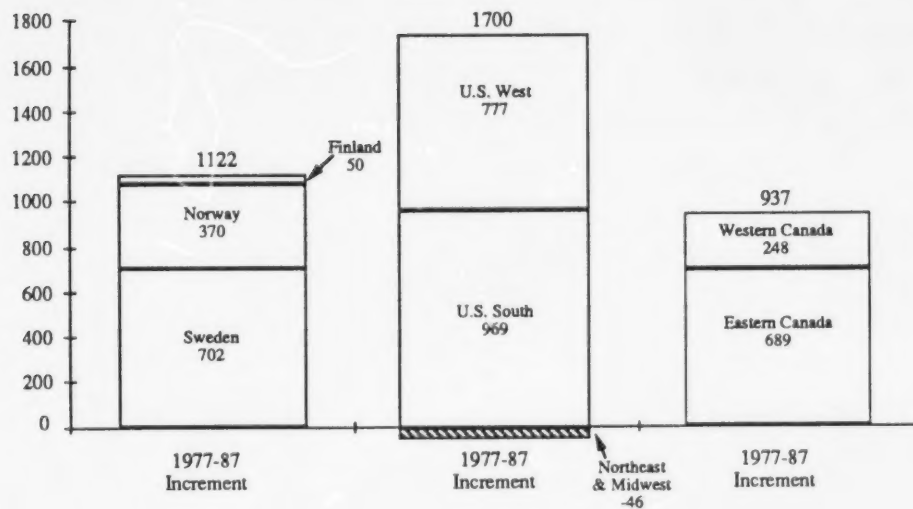
Figure 2-34
Average Machine Capacity for
Newsprint in 1970 and 1986
 (000 metric tons)



When recent capacity changes are reviewed, however, it is clear that the newsprint sector is becoming more segregated (Figure 2-33) and that Canada's best facilities are able to capitalize on high quality fibre resources and low cost power to achieve low unit operating costs and high quality paper. One of the world's most demanding newspaper publishers, Gannett Group, owners of USA Today, uses Canadian newsprint because of its high quality.

Figure 2-35 shows newsprint capacity increases over the 1977-87 period compared with other areas. It does not take into account the current wave of expansion (1986-91) which is discussed in detail in Volume III. Analysis of this 1977-91 capacity increase in Canada shows that the earlier part of the period was characterised by a mixture of expansions of existing mills (e.g. Western Canada), optimization and upgrading of older machines (particularly in conversion to twin-wire and speed-ups), especially in Eastern Canada.

Figure 2-35
Newsprint Capacity Growth in Canada
vs Other Areas 1977-1987
 (000 metric tons)



Source: WRA

More recently, however, the net increase in capacity has been characterized by a higher proportion of very large capital investments in state of the art, high quality, world standard paper machines. In almost all cases, these are based on TMP or CTMP technologies and have the flexibility of scope for:

- a) Cost savings through reducing the kraft component in standard grade 48.8 gsm news to 2-8% with the potential for a 100% TMP/GMP sheet and
- b) incorporating incremental improvements in technology as these emerge.

Figure 2-35 also shows that the US West, US South, Sweden and Norway increased their newsprint capacity significantly. In each case, but to varying degrees, the capacity increases in these areas can be considered world scale on the same basis.

Nevertheless, it is true that a significant proportion of the remaining capacity which exists today in both Canada, areas of the US and elsewhere cannot be considered cost and quality competitive and able to meet the market needs of the next twenty years. In Ontario, for example, over 60% of newsprint machines in 1987 were pre-1930 in terms of their original vintage (Table 2-3). Moreover, about 80% were pre-1960 in original vintage. Many of these machines produce an acceptable sheet by today's standards in North America; many do not. Only a few machines could be considered as potentially world class.

Table 2-3
Age Classification of Ontario
Newsprint Machines

	No. Machines	% of Total
1980 to present	3	15
1960 - 1980	1	5
1930 - 1960	4	20
Pre - 1930	12	60
Total	20	100

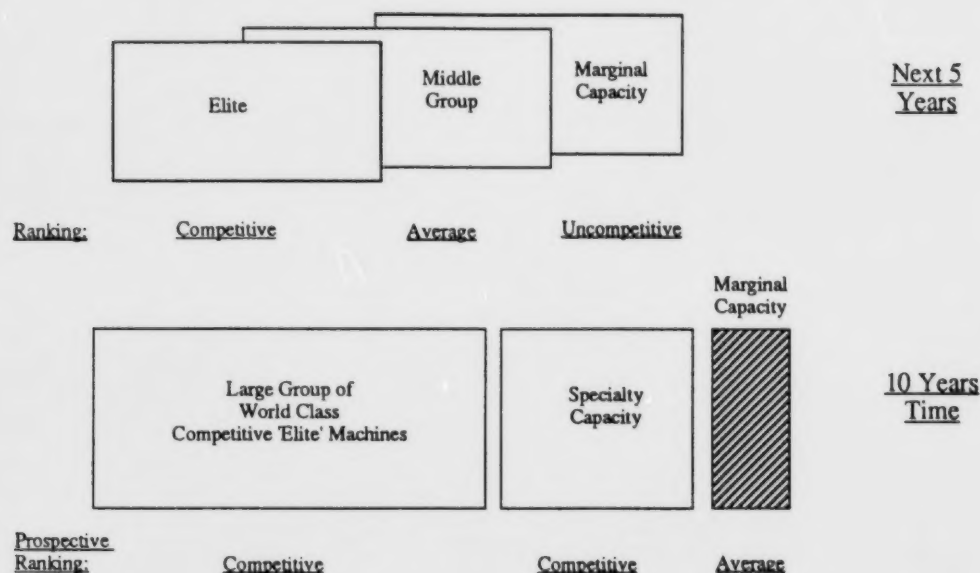
Source: WRA

Moreover, new and incremental capacity can be expected in other areas. As far as Canada is concerned, Volume III analyzes the existing newsprint capacity in each of the producing provinces. The overall conclusion from a national perspective is that over the next 5-10 years there will be an excess of capacity. This will however, be a short term situation leading to rationalization of overlapping capacity and shutting down, or in some cases, conversion, of non-viable machines (Figure 2-36). Within ten years, Canada has good prospects to achieve an even more broadly based and competitive newsprint/uncoated papers sector, in contrast to the wide range of machine qualities which exists today. In this perspective, the quality of recent investments in the newsprint sector by the Canadian industry has been very high and forward-looking.

As far as newsprint is concerned, Canadian provinces (including Ontario) potentially could emerge over the next ten years, with most of their capacity rated as highly competitive on a world scale, as distinct from only some of its capacity being in this category at present (Figure 2-36).

Figure 2-36
Canada's Newsprint and Mechanical Papers Sector:
Competitiveness Ranking on A Global Scale to Year 2010

Note: Schematic Not To Scale



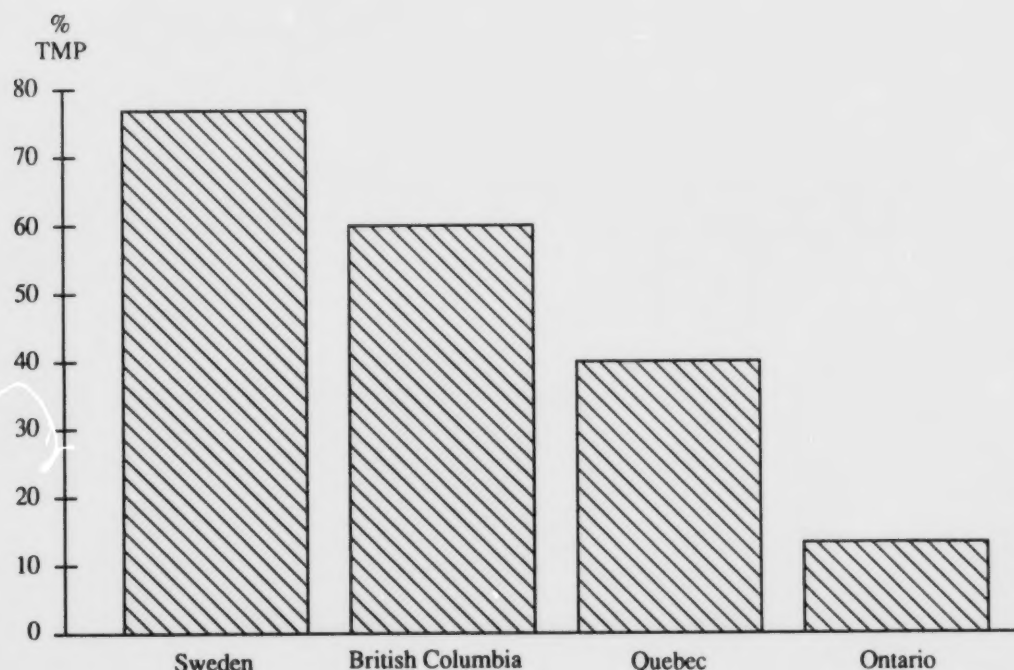
Some uneconomic, small, narrow trim machines are likely to be reasonably, and in some cases, very competitive in specialties, when converted from standard grade. The marginal capacity in the year 2010 would represent machines which today would be regarded as average. Thus, the longer term prospects are described in terms of high world average standards which are likely to be in existence by the year 2010. Note that because of the ongoing improvements occurring in average capacity standards worldwide, the rankings for the "next five years" are, therefore, not directly comparable to those shown for the period "10 years time".

Clearly, this ranking is based on Canada's competitiveness in the four principal cost components already noted. It assumes that the investment climate, and other factors, will be conducive to achieving the required level of investment. This will be essential if the labour productivity and technological base of much of Canada's existing capacity is to be improved.

For example, in Ontario an average of 6 man-hours/tonne are required for newsprint production. Quebec is only marginally better. Even BC, which is substantially better than the Canadian average, is only just comparable with the average for the US South. Finland enjoyed a high average standard in 1987, and Sweden (which started recently from positions similar today to Quebec) is likely to achieve very high machine productivity, on the average, over the next few years (see Volume III for details).

Fortunately, as noted earlier, parts of Canada are moving in this direction too: moreover, Canada's cost competitiveness, assuming that a comparable investment and trade climate exists, has the potential to exceed that of Sweden and Finland. The ratings are explained further in Volume VI. In part, this is based on Canada's strong position in power intensive technologies, such as TMP (Figure 2-37) which is being adopted increasingly in Canada as old capacity is upgraded or converted.

Figure 2-37
Use of TMP in Newsprint



Source: WRA

More detailed regional analyses within Canada are provided in Section 3.0.

2.2.5 Market Pulp

Not many years ago, Canada enjoyed a unique world role. Just as it is today, it was then the world's largest producer of market pulp. There was a difference, however, between then and today. Canada was then one of a few suppliers: moreover, one of its major commodity products, softwood market pulp, dominated supply. Today, as the vast increase in membership in the "million tonne club"¹ attests, the global structure of paper and paperboard supply has broadened significantly. Market pulp supply also has widened well beyond the formerly dominant Norscan group and well beyond its formerly fairly narrow species range.

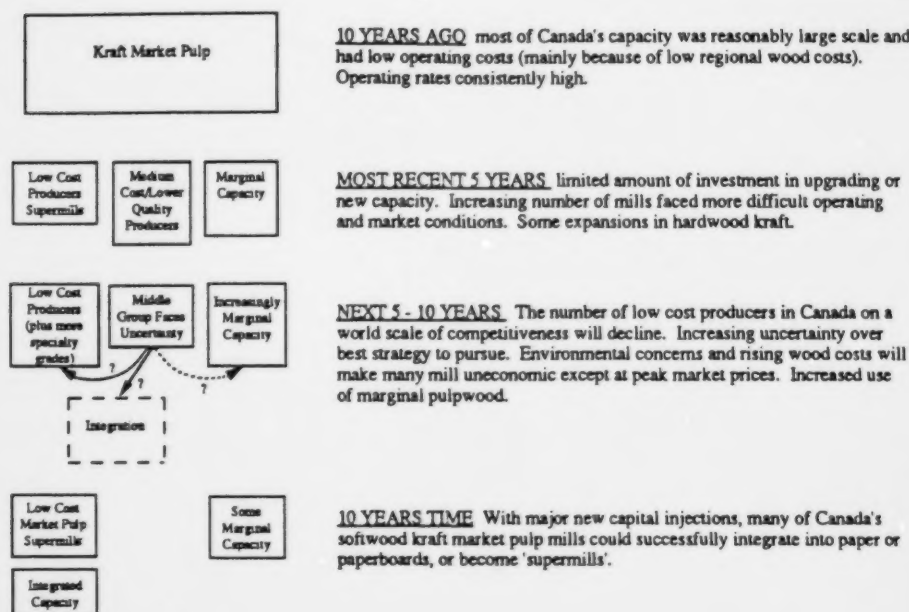
These have been very positive developments for the industry, in the global sense. As far as many Canadian producers are concerned, however, they have raised some uncertainties about the future. Despite the fact that Canada's market pulp sector currently is enjoying a period of very high prices, apart from some special factors very limited amounts of upgrading have been taking place to keep the sector at a strongly competitive world class level over the longer term.

Ten years ago, Canada's low wood costs and high operating rates kept its overall operating costs low by world standards. The early 1980s, however, were a turbulent time. A few Canadian mills have emerged as low cost super mills by world standards, but a large number now fall into the category of being: (a) medium cost producers on a world scale and/or; (b) low quality producers (Figure 2-38). In addition, Canada currently has market pulp capacity which at best can only be considered for the future as being marginally competitive in terms of operating costs and pulp quality.

¹ Countries which each produce more than 1 million tonnes of paper and paperboard each year (but which are not necessarily self sufficient in pulp).

Figure 2-38
Canada Has Lost Some Competitiveness in Kraft Market Pulp

Note: Schematic Not To Scale



Over the next 5-10 years, our analyses indicate that the number of low cost producers of softwood market pulp in Canada on a world scale of competitiveness will decline. For a number of reasons, discussed below, there is likely to be increasing uncertainty over the best strategy to be pursued by average cost producers in Canada. The situation varies from region to region. Of particular concern to many producers will be the following factors:

- * high cost of greenfield or incremental capacity, which will require (a) pulp prices consistently at or around current levels in order to achieve an acceptable rate of return on shareholders equity or (b) effective reduction in shareholders equity by way of special financial packages or (c) lower total investment/financing costs, or all of these;

- * uncertainty over the trend in pulp prices, particularly if exchange rates change significantly from their present relationships, which favour Canada;
- * uncertainty over the extent to which Canada's predominantly softwood bleached kraft market pulps will be displaced by the increasingly desirable hardwoods and by some mechanical pulps, such as bleached CTMP;
- * uncertainty over the trend in wood costs;
- * uncertainty over future environmental regulations and possible major additional expenditure on capital equipment related to changing regulations;
- * for many mills, uncertainty over whether to invest in a more efficient and world scale market pulp mill or alternatively to integrate into paper or paperboard making at an opportune time (e.g. BC Coast, Quebec and Ontario).

Nevertheless, on the basis of competitive rankings described earlier (and detailed in Volume VI), some areas of Canada have a potentially enviable position in softwood and hardwood market pulp. Few are as competitive in the major cost elements as the newly emerging low cost suppliers such as Brazil, Chile and potentially others. Canada has a large and well established market position and the erosion of its competitive position is likely to proceed fairly slowly. As a corollary, new suppliers frequently are very competitive in the cash-costs of production, but supply frequently is constrained and new greenfield capacity often involves significant infrastructural capital before it can be developed.

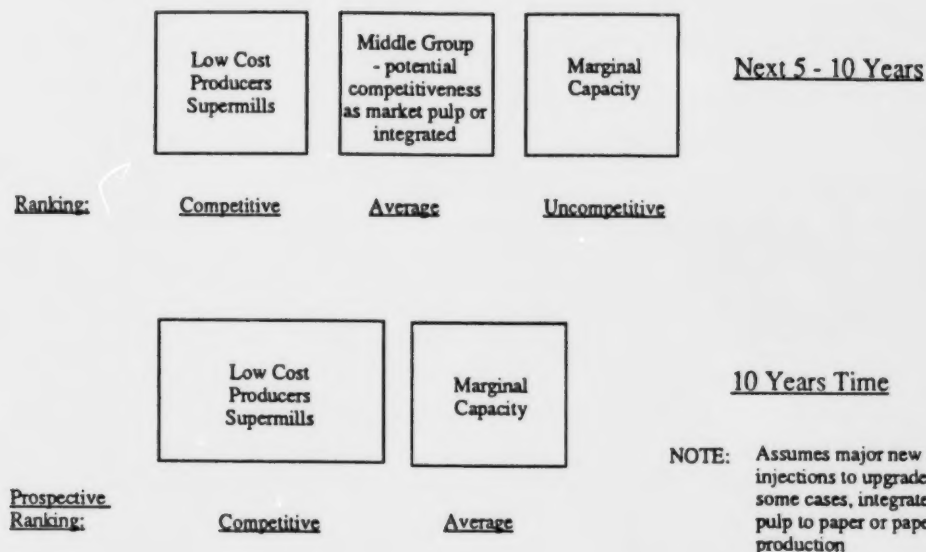
Nevertheless, it is clear that more and more countries (including some under-developed regions within the existing developed producing countries) aspire to have papermaking capacity. The economic and social impetus to subsidize pulp making capacity will be strong. In this respect, subsidized capacity in market pulps may be regarded by these regions as a means for utilization of available timber resources and the essential route to future integration into papermaking.

The conclusion of our analysis, therefore, are very dependent on how the uncertainties facing the sector are addressed and overcome. Some of the factors are external, in the sense that Canada has little control over them. Others are subject to policies over which Canada exercises varying degrees of control.

In order to achieve world class competitiveness in terms of operating costs and product quality, Canada's market pulp sector faces the prospect of very large capital expenditures (Figure 2-39). These expenditure will be necessary even if parts of the sector are integrated subsequently.

Figure 2-39
Canada's Market Pulp Sector: Competitiveness Ranking
on a Global Scale to Year 2010

Note: Schematic Not To Scale

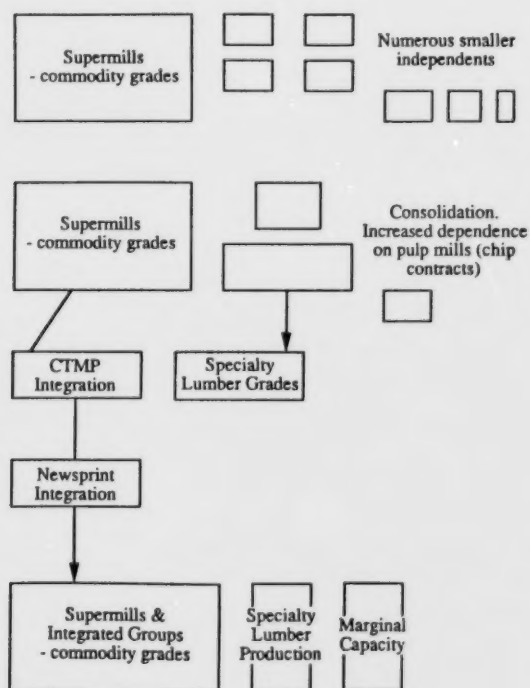


2.2.6 Softwood Lumber

Over a considerable period, Canada has achieved a very competitive position globally in the production of commodity grade softwood lumber. Initially, this was attributable to the availability of low cost, high quality large sawlogs. Since the 1960s, the major engines of growth, increasingly have been the development of large scale, highly efficient low unit cost sawmills and the rapid expansion of the US market (Figure 2-40). Moreover, as noted earlier, chip revenues have become an essential component of cost competitiveness.

Figure 2-40
Canada's Softwood Lumber Sector Has Reached Maturity and Slow Growth

Note: Schematic Not To Scale



10 YEARS AGO U.S. market still expanding rapidly. Canadian lumber grew larger and more highly competitive. Low sawlog costs (west) and/or chip revenues and high demand (east) led to further capacity expansions. Canada achieved 35% share of U.S. market.

MOST RECENT 5 YEARS Real prices declining for commodity grades. U.S. protectionist action. Mills becoming more automated and achieving high levels of productivity.

NEXT 5 YEARS Smaller independents join together as consortia and integrate more strongly with pulp sector. Increasing emphasis on productivity and optimization. Rising sawlog costs.

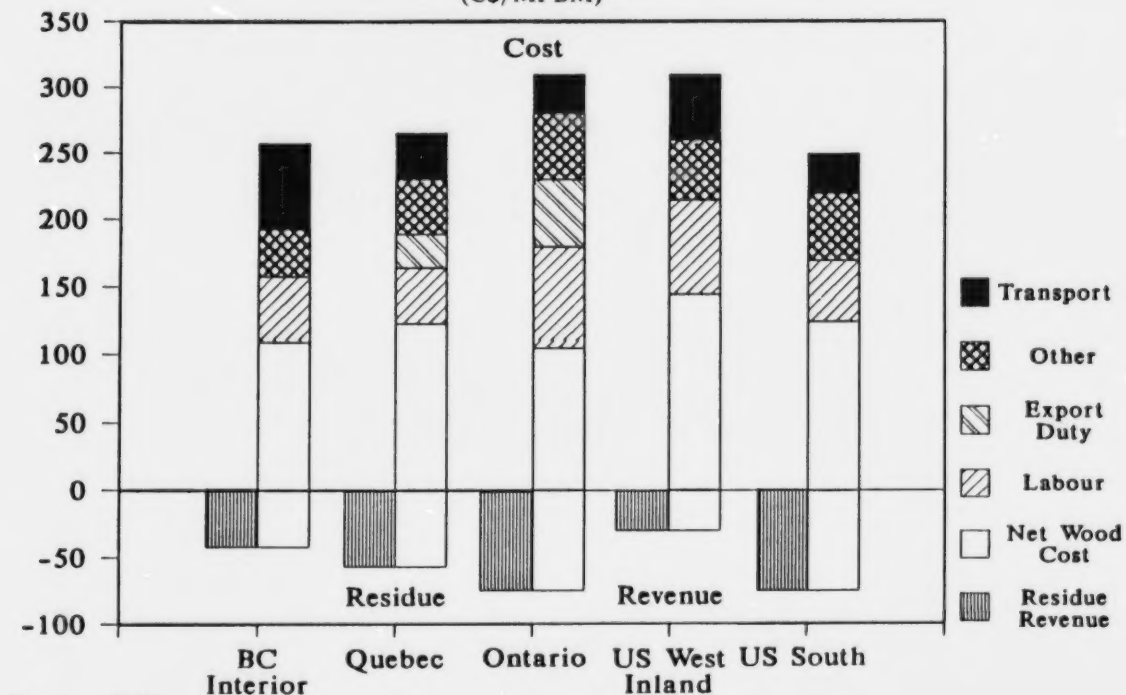
10 YEARS TIME Fewer independents than today. Larger more integrated groups or consortia. Common marketing approach. Some independents capture higher value through CTMP market pulp or newsprint.

During the 1980s, the fortunes of the lumber industry in Canada have begun to shift. Real prices have continued to decline, particularly when improved product quality is taken into account. Moreover, US protectionist action is likely to have an increasingly significant impact on Canadian competitiveness in softwood lumber over the medium to longer term. Nevertheless, Canada still accounts for 11-12% of world lumber production (all species) and close to 45% of world trade. As noted earlier, this dominance as a major supplier, while declining, is significant. So, Canada is well placed to serve the large US import market over the short to medium term.

The impact of the export duty is illustrated in Figure 2-41, which compares delivered lumber costs to the US from the BC Interior, Ontario and Quebec with those of the US South and US West Inland. Despite the higher transportation charges, the BC Interior and Quebec are cost competitive with the US South. Net wood costs, together with residue revenue, clearly are significant determinants of profitability. Today, these regions have comparatively low wood costs. Ontario, on the other hand, faces a similar situation as does the US West and both have costs which are appreciably higher than the other regions.

The impact of revenue from chips and other residue is of very great significance and has been highlighted in Figure 2-41. It can be seen, for example, that though the total cost of wood in lumber manufacture is much higher in Ontario than in BC, the net cost is similar. In overall terms, it is evident that the US South, Quebec and the BC Interior are reasonably similar, but Ontario and the US West are appreciably higher. It should also be noted that costs vary significantly in each region and the levels used are averages. In Ontario, for example, there are some mills with appreciably lower costs than these shown.

Figure 2-41
Delivered Lumber Costs to the US
 (C\$/MFBM)

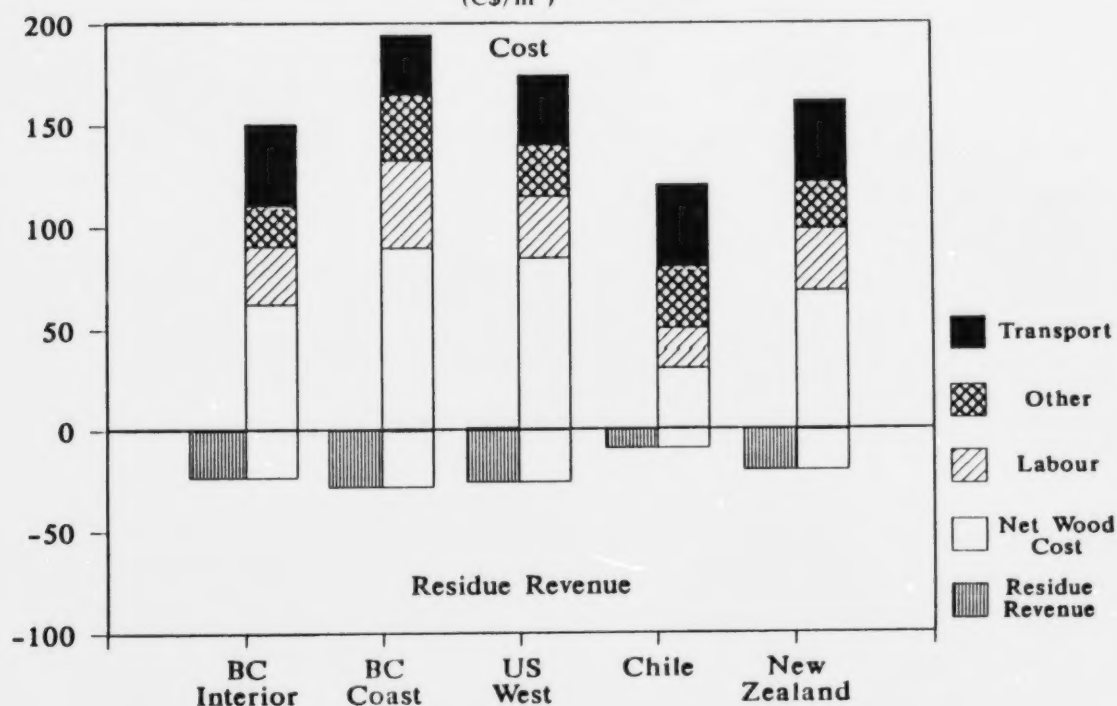


Canada has traditionally enjoyed a 99% share of US softwood lumber imports, and the major competition has been from US suppliers. Scandinavian suppliers are unlikely to become relevant except, possibly, for some very specific items, but there is considerable potential for the development of suitable manufacture in Chile.

Canadian commodity grade lumber producers' competitiveness increasingly depends on maintenance of the Canadian dollar at a discount to the US dollar. Potential competition in the US market is likely to develop as other suppliers increase their capability. It is estimated, for example, that Chilean lumber could be landed in the US South at around C\$240/MFBM, which would be well below Canadian suppliers' prices in the area and very competitive with local producers.

In Japan, Canada's main competition for imports comes from US manufacturers. There is also some limited, though possibly growing, competition from USSR lumber producers, but it is not possible to develop any relevant indication of likely costs from that region. Both New Zealand and Chile are potential competitors of significance, therefore, their costs are also included in the following comparison (Figure 2-42).

Figure 2-42
Delivered Lumber Costs to Japan
(C\$/m³)

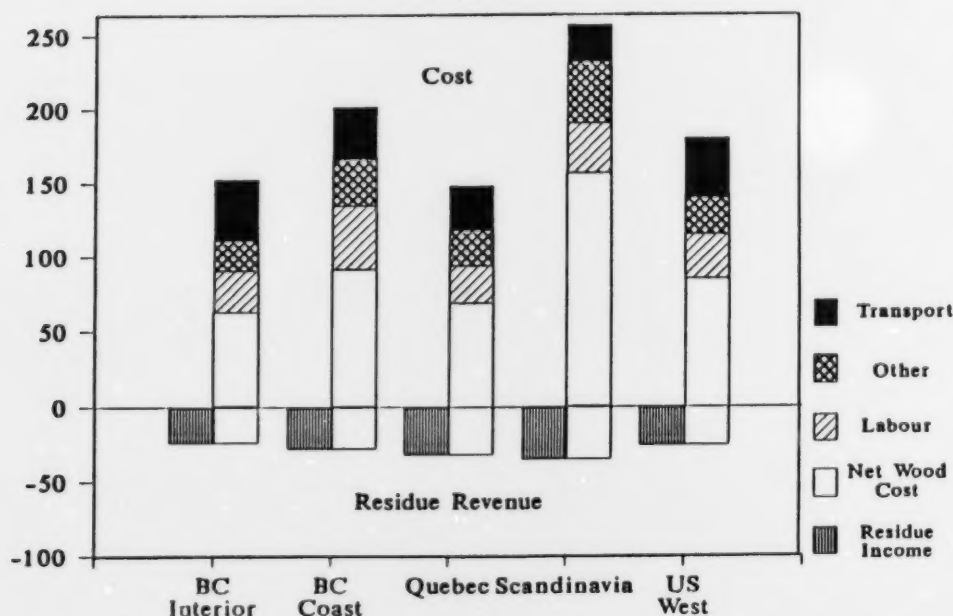


Source: RISI, WRA

The levels shown in Figure 2-42 are somewhat misleading since no allowance for quality is included. The product from Chile currently is only accepted as low quality packaging material and therefore commands a low price in the market, whereas radiata pine from New Zealand is being accepted, in part at least, as a construction material. The production costs for the BC Coast include the cost of manufacturing a wide range of specifications for a variety of markets. An appreciable part of the production would therefore command a reasonably high value in Japan. In contrast, the US West prices are based on a typical mill producing standard North American commodity grades. The cost of all components except transport would be higher for Japanese qualities. Though no precise figures are available, it is estimated that costs in the US West for the production of similar products would be similar to, if not higher than, the BC Coast levels.

In Western Europe, the principal competition for imports faced by Canada in the Western European markets comes from Scandinavia. At present, due to the comparatively weak dollar, the Canadian suppliers are very competitive (Figure 2-43), but this advantage is very vulnerable to fluctuations in exchange rate.

Figure 2-43
Delivered Lumber Costs to Western Europe
(C\$/m³)



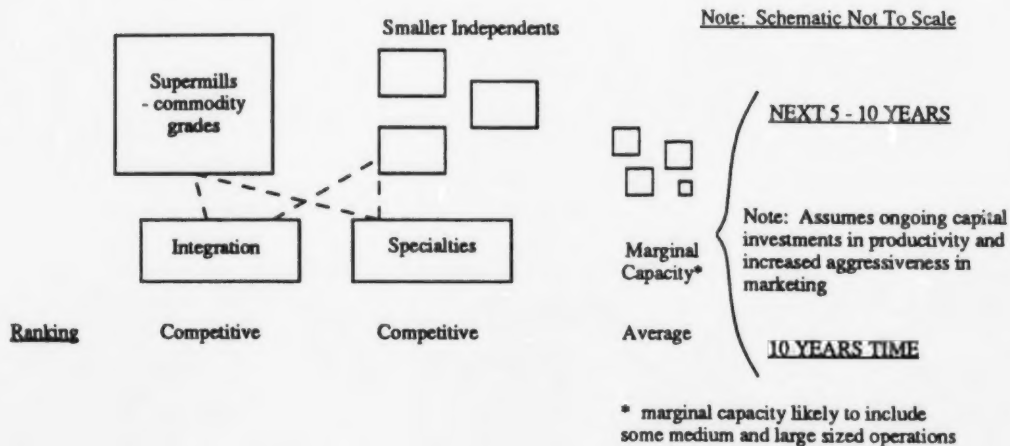
Source: RISI, WRA

It seems probable, in the context of the mature market conditions which exist for softwood lumber, that further consolidation will occur in the sawmilling industry (Figure 2-44). Increased integration is also likely. In most cases this is likely to be functional integration (i.e. interdependence of the lumber and pulp sector, without necessarily any ownership control by the pulp mills).

In addition, it is clear that an increasing number of independent sawmills are initiating their own integration (e.g. Millar Western, Fibreco) into CTMP and newsprint (e.g. Normick, Amos). Over the next ten years this is likely to be one of the routes through which independent lumber producers will achieve higher value added. Captive sawmills of large integrated companies increasingly are likely to follow the Swedish pattern of rationalization and optimization to achieve a balance with captive pulping and papermaking operations, and achieve the best value/m³ from the available timber resources.

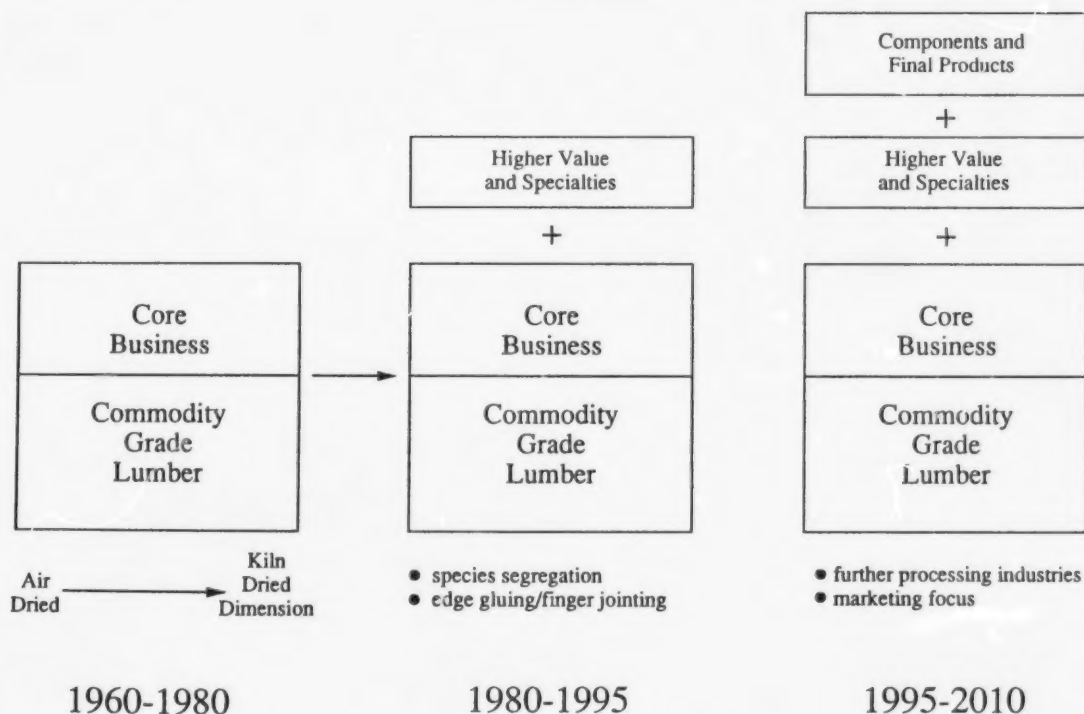
Also, higher value added already is being achieved by many formerly commodity lumber producers in Canada, though finger jointing, MSR lumber, industrial components and so on. Figure 2-44 shows that the outlook for Canada's softwood lumber is likely to remain competitive on a world scale in both cost and quality terms.

Figure 2-44
Canada's Softwood Lumber Sector: Competitiveness Ranking
on a Global Scale to Year 2010



For many businesses, the progression from commodity grade lumber to a broader product base, and enhanced competitiveness, can be summarized as in Figure 2-45.

Figure 2-45
Wood Products



This progression will depend on two major factors: the development of further processing capacity and a strong marketing/promotional effort. The ability to further process the fibre in order to extract its maximum value and a substantial consumer oriented marketing effort is essential. Greater numbers of customers and many more grades will complicate the relatively simple approach needed for commodity lumber. One result would be downstream integration with distributors and/or industrial consumers e.g. joint ventures between companies cutting the resource and manufacturers producing consumer goods such as windows or doors.

Panelboards

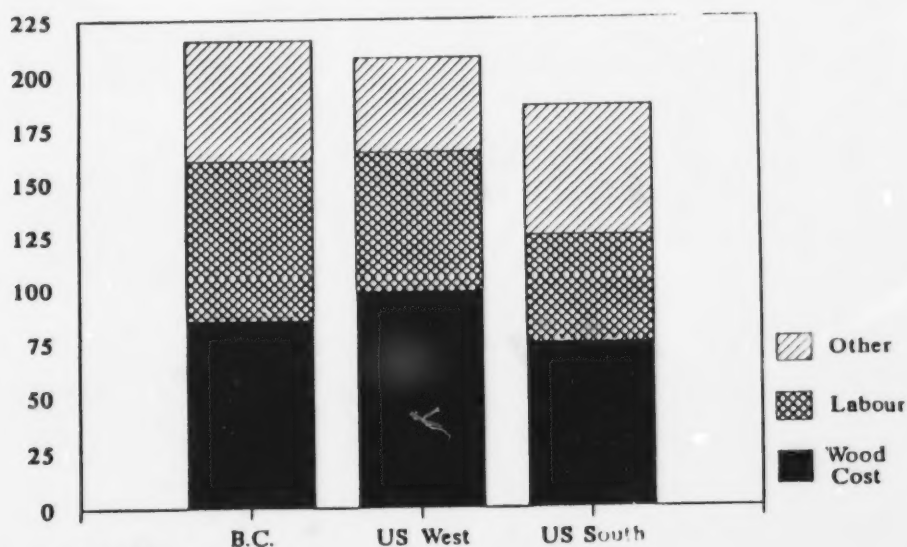
In Volume IV, we conclude that the principal growth opportunities for the Canadian panel products industries lie in North America, Western Europe and Japan. The competitive sources of supply to these areas vary depending on both the particular panel product and the market area.

Softwood Plywood

Subject to any substantive changes in tariffs between Canada and US, the manufacturing cost relationships between plywood producers on the two sides of the border are of little significance relative to sales into Canada or into the US. Canadian sales into the US are very marginal, and the US sales into Canada tend to be sporadic, depending on differential market price fluctuations in the two countries.

Where cost comparison is of much greater significance, however, is in competition for export markets. Canadian plywood is facing severe competition in Europe from both the US South and the US West. The comparison of costs shown in Figure 2-46 demonstrates at least part of the reason for the recent loss of market share in Europe.

Figure 2-46
1987 Production Cost - Sheathing Plywood
(Can \$/m³)



Source: WRA, RISI

Woodbridge, Reed and Associates

On the basis of the exchange rate prevalent in 1987, but allowing for higher stumpage costs, the production costs at Canadian mills for regular sheathing are slightly higher than the US West and significantly higher than the US South. It is believed, however, that the BC Interior mills (the major producers of sheathing) can lower costs substantially by modifying their plants to incorporate proven new technology. Indeed, a number of mills have already committed to such investment.

It must be borne in mind, however, that a simple comparison of this nature does not show the wide variations that exist between companies, even in similar locations, nor does it show differences in quality. For example, Canadian plywood is generally accepted in the export markets as being of a higher quality than CDX (see Volume IV Glossary) from the US South and the market will often pay a premium for the Canadian product.

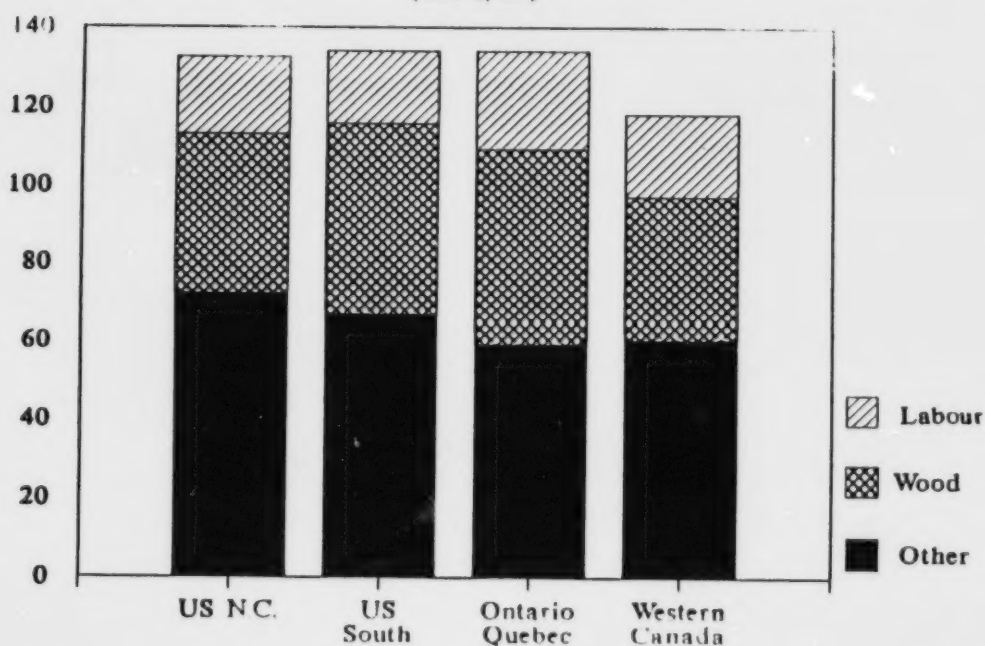
Production costs are likely to become even more critical in the future. With the exception of some potential in the offshore markets, the principal markets are not likely to grow and existing producers are expected to compete fiercely for market share.

Waferboard

The principal opportunities for Canadian producers of waferboard/OSB lie in North America. Growth is expected in the domestic market and Canadian suppliers have traditionally been able to compete in the North East and North Central US and, recently, in the US West. The comparison of production costs in the principal producing regions is shown in Figure 2-47.

Average costs in most areas are similar in total, but the very modern facilities in Alberta and BC are estimated to be significantly lower in cost. The major elements included under "other" are binders (resin, wax) and energy. It should be noted, however, that the exchange rate used for the comparison was that current in 1987. The strengthening Canadian dollar would effectively decrease the US costs.

Figure 2-47
1987 Production Cost - OSB/Waferboard
(Can \$/m³)



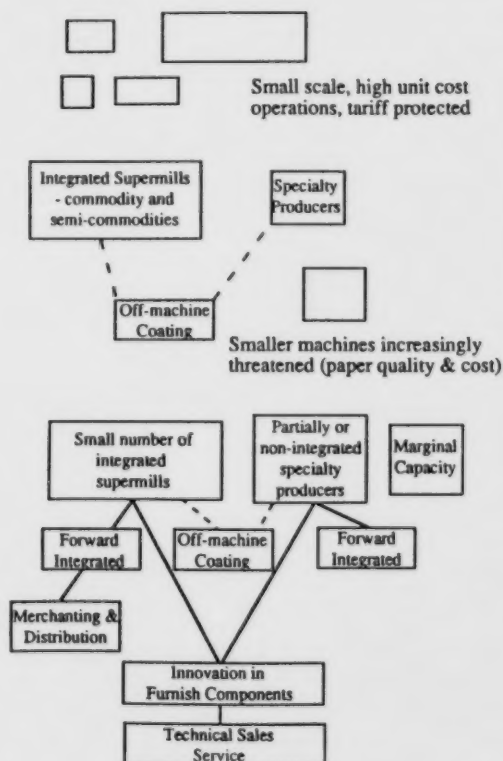
Source: WRA, RISI

2.2.7 Woodfree Paper

Uncoated Grades

Ten years ago, Canada was not competitive in uncoated woodfree grades. Its industry operated in a tariff protected environment, was small scale and produced relatively short runs of mostly uncoated specialties and small runs of semi-commodity and commodity grades for the domestic market. Unit costs were high and very little was exported.

Figure 2-48
Uncoated and Coated Woodfree Papers:
An Opportunity for Selected Integrated Development



10 YEARS AGO

In a tariff protected environment, most of Canada's capacity was small scale, frequently short runs of mostly uncoated specialties and semi-commodities, high unit costs and very little export volume.

MOST RECENT 5 YEARS

Rapid expansion of U.S. demand led to investments in large greenfield mills and machines in U.S. south. This, plus reduced tariffs, posed a simultaneous threat and opportunity to Canadian producers. Major capacity expansions announced, increased use of low density hardwood furnish.

NEXT 5 - 10 YEARS

Emergence of a small number of supermills and a group of partially or non-integrated specialty producers. Major investments required to achieve and maintain competitive position.

10 YEARS TIME

Technological challenge to this sector in Canada will be to produce highest quality woodfree paper that is technically possible using some mechanical pulp furnish.

Canada is currently increasing its capacity in uncoated woodfree papers aimed at the US market. This involves integration of existing pulping capacity (e.g. Weyerhaeuser, Prince Albert), expansion of mills already producing these grades (e.g. Domtar, Windsor) and similar expansions (Great Lakes Forest Products, Dryden) (Table 2-4).

Table 2-4
Planned Printing and Writing - New Machines
Over 100,000 tpy

Installation	Start-up	Product*	Capacity (000 tonnes)
Domtar, Windsor	1989	U-WF	114*
Great Lakes, Dryden	1989	U-WF	175
Weyerhaeuser, Prince Albert	1989	U-WF	181

U-WF - Uncoated Woodfree

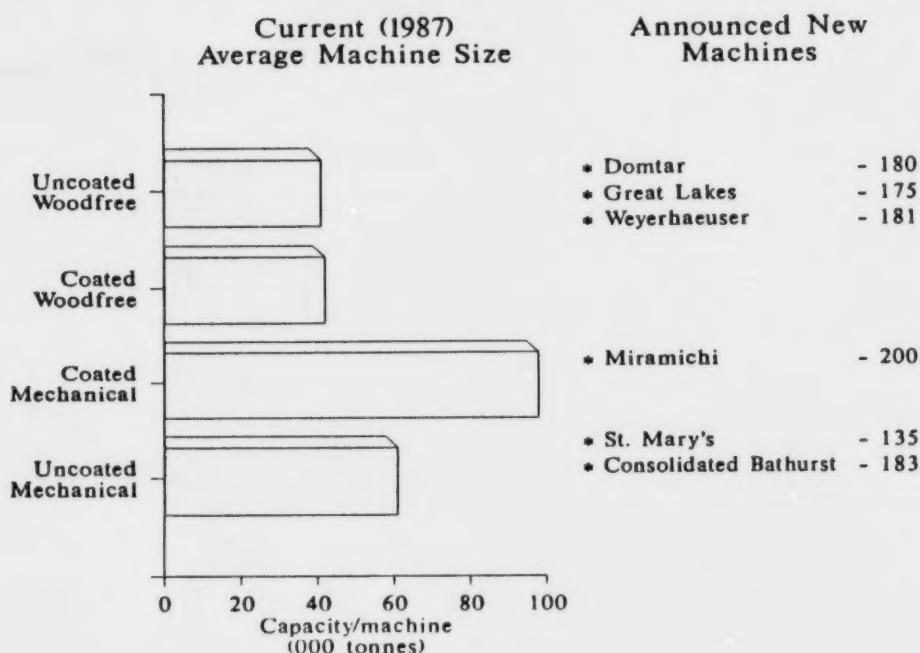
** Net increase in capacity, machine output will be 180,000 tonnes

Source: Pulp and Paper, Project Report, January, 1988

The changes have been very recent. The capacity additions will improve Canada's average competitive position where it is needed the most. The uncoated woodfree sector is still characterised by small machines, yet produce more of the commodity oriented products (Figure 2-49). The addition of new machines, of course, does not improve the position of the old machines. Clearly, the smaller machines will need eventually to move further up the value-added scale, as they have been doing in some cases, or be replaced by new machines in the long term.

Canada's average machine size in this sector is small in comparison with the US, which has many large high volume, low unit cost installations. Moreover, operations in the US are much more integrated, through merchanting and captive distribution than are most Canadian producers.

Figure 2-49
Average Machine Size
Canadian Printing & Writing Paper Mills



Source: WRA Data Bank, Post's Pulp & Paper Directory

The competitive position of a few of Canada's uncoated woodfree installations is not encouraging. A major factor is the lack of integration with the pulp supply. On average, Canada's producers rely on market pulp (or at least dried and transferred) for more than half their needs. Their US counterparts, for example, are about 75% integrated.

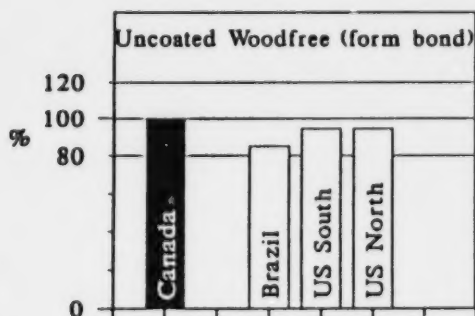
The recent capacity additions (i.e. GLFP, Dryden and Prince Albert) were built, in part, to achieve integration of market pulp. Many older mills, however, do not have the same opportunity. Integration of these non-integrated printing/writing mills through affiliation with pulp producing operations is an alternative and corporate concentration activity is providing this pulp supply link for a number of these mills. Those operations with small machines, which are neither integrated nor affiliated with pulp supply, are particularly vulnerable. Alternatives include further specialization and/or further upgrading to coated woodfree products. The latter, of course, is also considered a potentially attractive market-led opportunity for Canadian producers.

In Volume VI, our analysis of fundamental cost factors indicates that, in a North American context, the most competitive producing region in uncoated freesheet grades is the US South. In commodity grade freesheet, both Quebec and Ontario fall closely behind the US South. In a global context, however, the very low wood costs of Brazil and Chile (and possibly other areas with similarly low wood costs) make them the most cost competitive in uncoated woodfree grades. Moreover, based on Brazil's high quality plantation eucalyptus resources, it is expected to remain highly competitive. Chile's dependence on plantation radiata pine gives it a cost, but not necessarily quality, advantage.

Nevertheless, Canada's cost position is potentially reasonably competitive (Figure 2-50) and its location, vis a vis the large and expanding US market, provides scope for forward integration through merchanting and distribution, as well as value-added through attention to service and quality.

The growth in alkaline papermaking capacity provides a targeted niche for Canadian producers which is expected to become increasingly important. Moreover, utilization of Canada's low density hardwoods (e.g. Prince Albert aspen) and eastern hardwoods (Dryden and Windsor) ensures that market requirements for superior printability and related characteristics can be achieved.

Figure 2-50
Canada's Cost Competitive Position
Printing and Writing Papers - New Integrated Mills
 (Relative Cost/Tonne - Canada = 100%)

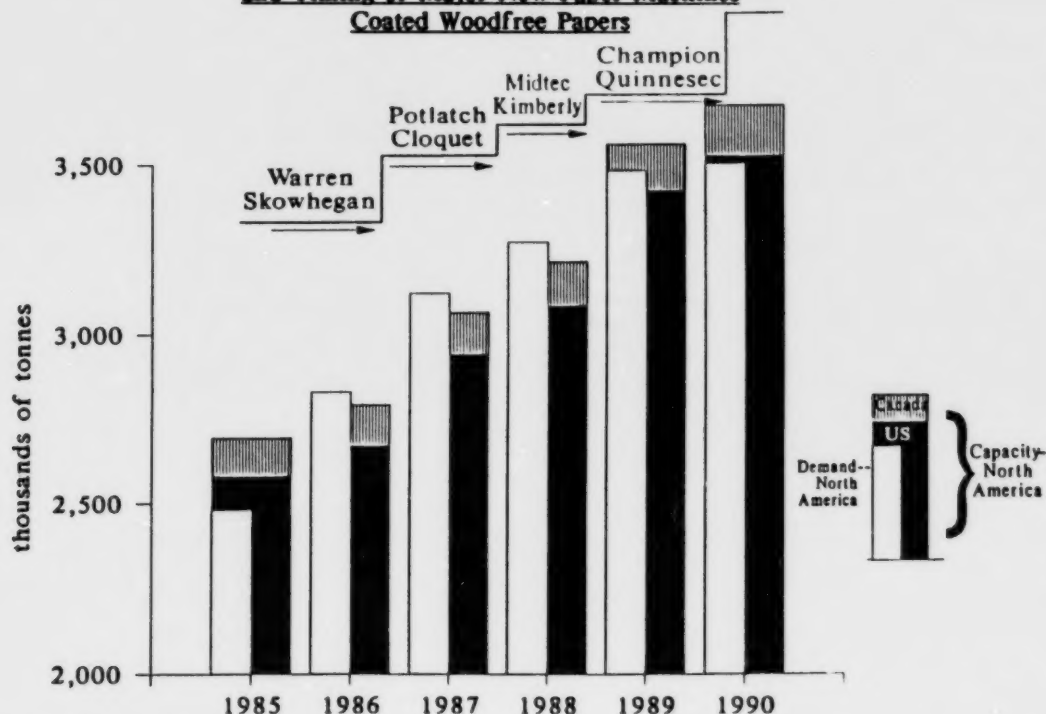


Coated Grades

Ontario is the only region of Canada which has coated woodfree capacity. In comparison with commodity uncoated grades such as photocopy and forms bond, coated woodfree grades tend to be much more quality and service orientated, and less sensitive to price fluctuations.

In North America, the coated woodfree segment has been active but at a more balanced pace than the uncoated woodfree sector. The coated woodfree industry in the US did not have a machine over 150,000 tpy until Warren's Hinkley mill (Scott Paper Co.) was built in 1982. While Warren added another major mill in 1986, future increases are expected to be more modest, with large scale machines replacing older, smaller machines. Net capacity increases will therefore be somewhat lower for planned mills like Potlatch-Cloquet and Midtec-Kimberly (Figure 2-51). The coated woodfree supremacy war continues in the short-term, as Champion recently announced the largest such machine yet at 230,000 tpy, scheduled to start up in 1990.

Figure 2-51
North American Supply/Demand Balance
and Timing of Major New Paper Machines
Coated Woodfree Papers

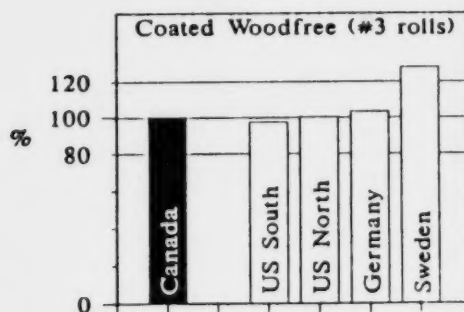


Source: RISI, API, WRA Data Base

Many other capacity additions in the coated woodfree segment are less grandiose, however, with machine upgrades and speedups a normal activity.¹

The analysis of Volume VI indicates that Chile and Brazil are the most cost competitive of coated woodfree paper producers on a global scale; however, overall competitiveness is determined by a wider range of considerations. The US South is very cost competitive and is able to provide good service within its own domestic market. In commodity grade coated freesheet, both Quebec and Ontario follow very closely behind the US South, in part because of their access to the US South's clay deposits at competitive cost (Figure 2-52).

Figure 2-52
Canada's Cost Competitive Position
Printing and Writing Papers - New Integrated Mills
 (Relative Cost/Tonne - Canada = 100%)



Note: Regions chosen for comparison, based on most probable competitive threat expected in the future.

Source: Temanex, Price Waterhouse, WRA Data Base.

¹ Island Paper Mills has now announced the addition of an off-machine coater.

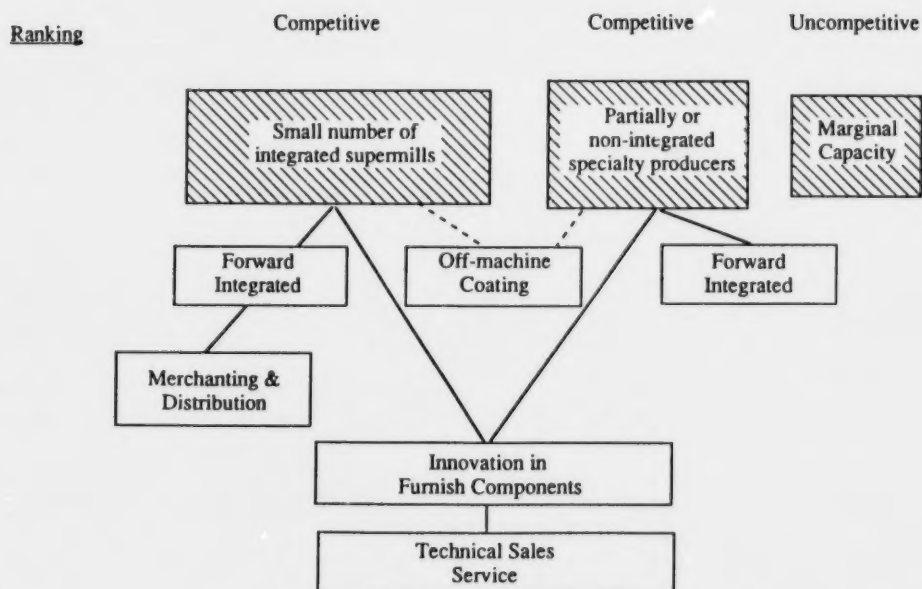
With coated and uncoated woodfree grades, the competitive position of Canada potentially is moderately good. The most likely scenario over the next ten years is summarized in Figure 2-53. The numbers of Canadian super mills in these grades will be very limited, but considerable scope exists for cost and quality competitiveness particularly where Canada's lower density hardwoods are utilized.

In addition, considerable scope exists for innovation in furnish components (e.g. Sweden's Composit), technical sales, service and responsiveness to market needs, notably through merchandising and distribution of the more demanding grades.

As we point out later in this section, the technological challenge to Canada is to move away from rigid definitions of woodfree and wood-containing papers and develop innovative grades which are specifically engineered for particular end-users. Moreover, this could be a viable option for some of Canada's marginal capacity in market pulp. In Volume III, we discuss the scope for this in greater detail.

Figure 2-53
Uncoated and Coated Woodfree Papers:
Competitive Ranking on a Global Scale to Year 2010

Note: Schematic Not To Scale

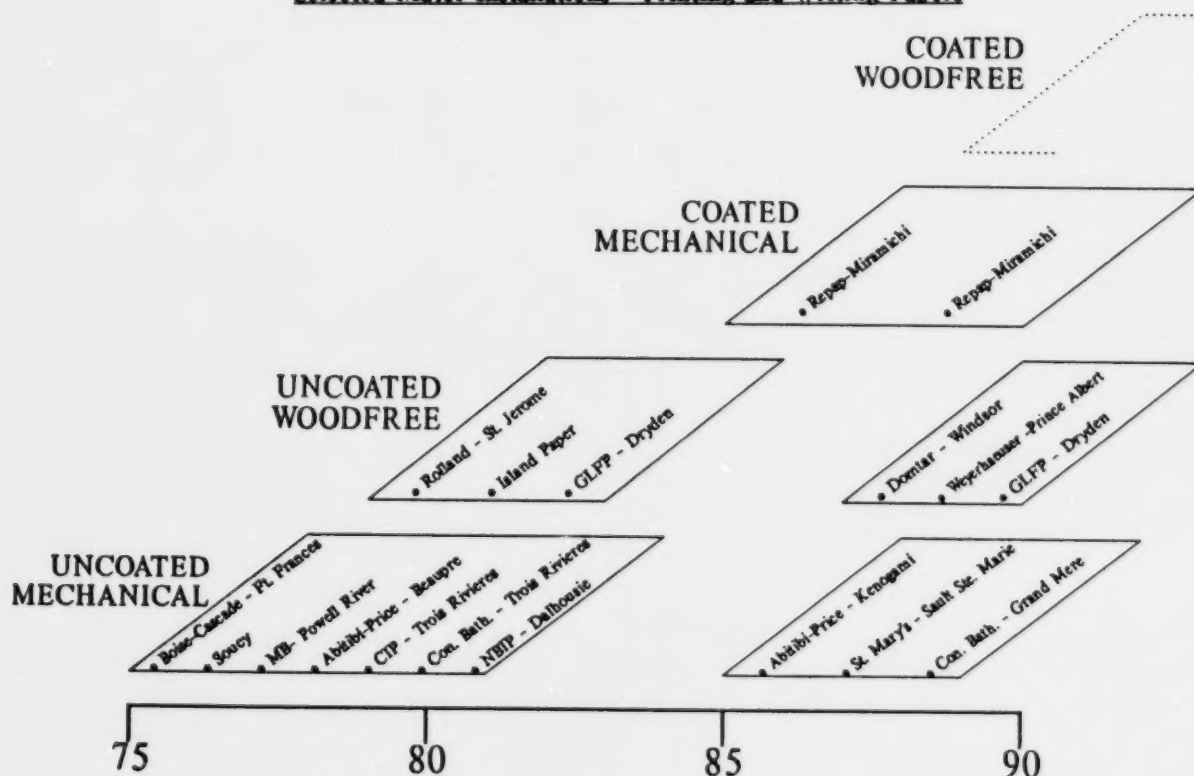


2.2.8 Other Printing and Writing Papers

In Volume III, we point out that one of Canada's most significant growth opportunities lies in expanded capacity in printing and writing papers. In particular, Canada's cost competitive position favours mechanical pulp based printing and writings. Many of the arguments in favour of this scenario already have been presented in Section 2.2.2. In addition, it appears likely that coated mechanical printing and writing grades will represent further growth opportunities.

Following the expansion of uncoated mechanical grades in the late 1970s and early 1980s, expansions in the coated mechanical segment have begun and promise to emerge gradually (Figure 2-54).

Figure 2-54
Capacity Expansion Eras in Canada
Selected Major Installations - Printing and Writing Papers



Source: WRA database

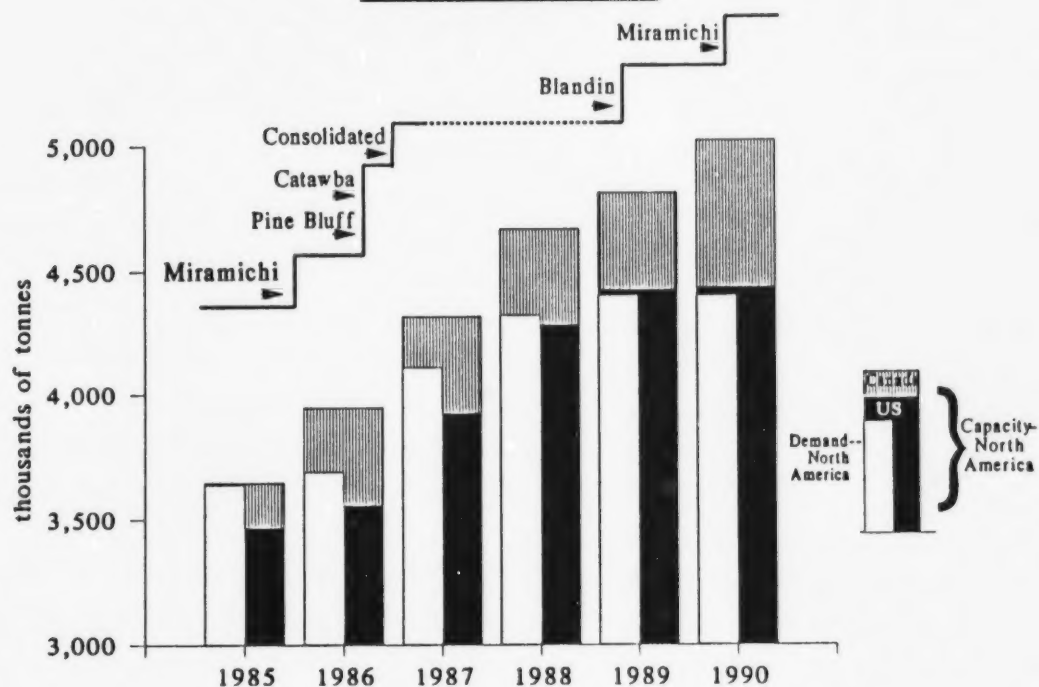
Repap's initiative at Miramichi is based on state-of-the-art paper machine capacity, integrated with existing chemical pulp (Newcastle mill) and mechanical pulp capacity.

Building presence in the printing and writing market will not be an easy undertaking. US and Western European producers have also recognized the need to move to value-added products in favour of commodities. US producers have added a great deal of coated paper capacity over the past decade, and most recently much of that capacity is in the form of large-scale machines.

Following a major round of LWC capacity additions in the early 1980s (Boise-Rumford, St.-Regis-Sartell, Mead-Escanaba, Weyerhaeuser-Columbus), four more new machines were started up almost simultaneously in 1986. North America moved from a capacity balance position in 1985 to a continental surplus in 1987. This oversupply situation resulted in a weakening of LWC prices, which, in turn, caused an increase in demand. The rapidity of the change from oversupply to relative tightness of the LWC market surprised many in the industry. The reverse in the relative value of European and North American currencies also helped the US situation with reduced imports and increased exports. However, this provides a good example of how attractive pricing and adequate supply of universally accepted products can dramatically spur demand.

Already, new capacity is being planned for 1989. Canadian producers have been a part of these recent capacity increases with one new modern machine in Atlantic Canada during the 1986 capacity surge. The same producer is also reporting plans for the next round of increases as well (Figure 2-55).

Figure 2-55
North American Supply/Demand Balance
and Timing of Major New Paper Machines
Coated Mechanical Papers



Source: RISI, API, WRA database

Our analysis suggests that Canadian producers can be particularly competitive in the mechanical grades. The high level of value-added activity characteristic of Maine, for example, could be mirrored in New Brunswick and Quebec. Similarly, Ontario has the inherent ability to undertake projects characteristic of the US Midwest (Minnesota, Wisconsin and Michigan).

2.3 SUPPORTING FACTORS

In the conclusions to this section "Are We Well Placed For The Future?", we present our assessments of factors which are likely to support growth in Canada's forest industry. These factors, and their broad impacts, are:

<u>Factor</u>	<u>Impact</u>
1. High Quality Fibre	Value-Added Potential
2. Low Cost Purchased Power	) Competitiveness in Power
3. Additional Generating Capacity Available	) - Intensive Technologies
4. Canada-US Free Trade Agreement	Market Expansion
5. Technological Developments	Value-Added Potential

2.3.1 High Quality Fibre

Canada has one of the largest commercial forest harvests in the world. In 1985, its softwood harvest level was 155 million m³ and its hardwood harvest was 18 million m³ (Volume V). Canada's existing standing inventory of commercial timber comprises a wide range of species. Many of these, such as aspen, are only beginning to be recognized for their benefits to the pulp/paper maker. In Canada's lumber sector, lodgepole pine increasingly provides higher rates of return than do other softwood species as offshore consumers' desire for "redwoods" is recognized.

One of the major supporting factors to Canada's prospective growth is the high quality of its existing standing inventory of timber. It is the envy of many parts of the world. There are problems related to insect infestations in some areas (notably spruce bark beetle and pine bark beetle). Nevertheless, as a basis for increased value added, Canada's forest resources are a major asset.

As increasing problems are encountered with ecologically sensitive areas, many of Canada's better growing sites could support even greater intensive forestry efforts. In this respect, public ownership of the vast majority of Canada's timberlands precludes many of the constraints imposed by dependence on supply from private timberland which, in this respect, are a mixed blessing in areas of the US South, Sweden and elsewhere in Europe.

Correspondingly, in Section 4.0, we also discuss some of the partnership responsibilities which this imposes on provincial forestry ministries if the value of Canada's high quality timber resource is to be managed properly and enhanced for the future.

2.3.2 Purchased Power

In Volume VI, we present an analysis of current purchased costs of electrical power for forest products operations. That analysis was summarized earlier in this section. It showed that Canada currently has a very important advantage in its purchased electrical energy costs, on an international basis. Moreover, it is expected that Canada is likely to be in a good position to maintain this advantage against major competitors in forest products manufacturing. As already stated, this has important implications for Canada in terms of the types of power intensive technologies which are likely to offer comparative international trade advantages to its forest products companies.

As shown in Table 2-5, mechanical pulp based products such as newsprint and groundwood specialties are very power intensive forest products when compared with other pulp and paper grades. In addition, they are among the highest power consumers of any industrial sector, except for aluminum and a few other notable examples.

Table 2-5

Operation	Net Power Requirements (megawatts)
Bleached Kraft Pulp (BKP)	5-15
Thermomechanical Pulp (TMP, CTMP)	50-60
Newsprint (including pulping)	70-80

The above table shows that, on a net basis, the kraft pulping process can be virtually energy self-sufficient. Its requirements for outside power typically are very low. Many Canadian and US mills, particularly those built prior to the mid 1970s (as most of them were), are not as energy efficient as many newer mills, or recent capacity expansions. High cost energy areas, such as the Nordic countries, generally have been more aware of the need for energy self-sufficiency and have built or upgraded their market pulp and integrated paper mills accordingly.

The table also shows that mechanical pulps, such as TMP, CTMP and PGW, are large net users of electrical power. Correspondingly, mechanical pulp based papers such as newsprint, traditionally have exploited Canada's cost competitive strengths. We expect this to be the case in the future, not only for newsprint but also for a wide variety of other wood-containing papers. In particular the higher valued products including light-weight and medium weight coated publication and printing papers, filled or super-calendered grades and so on, will become increasingly important to the Canadian industry. In addition, there are many other grades of papers and paperboards, such as multi-ply board, which will exploit Canada's favourable power situation (see Volume III).

Canada has a long history as a producer of kraft market pulps, predominantly softwood grades. Yet, the conditions which bolstered its traditional pre-eminent position as a market pulp producer in these grades, have been changing. Firstly, supply dominance (Figure 2-56), which Canada shared with a few other major Norscan exporters, no longer exists. Moreover, Canada's softwood kraft supply, while still very important in volume terms, no longer dictates pricing to the extent that it did. In addition, market and technological factors have changed (Figure 2-57) in favour of other pulps and other suppliers.

Figure 2-56
Historical Reasons for Canada's
Softwood Kraft Market Pulp's Dominance

- Canadian mills' pricing had a marked effect on world prices.
- Canada's kraft pulp sector was the largest non-integrated industry of its type worldwide (in contrast, other large suppliers such as Sweden and the US became increasingly integrated as wood costs rose and duty-free markets expanded).
- Economics did not favour integration into papermaking in Canada (eg. the domestic market for woodfree papers was too small and export markets were protected).
- Paper machine and other technological limitations favoured strong, long-fibred pulps.
- Trade patterns strongly favoured Canada's market pulp supply role in these long-fibred pulps.
- Softwood grades dominated true market pulp supply.
- Canada was one of the few suppliers.

Figure 2-57
Recent Changes in The Conditions That Traditionally Favoured
Canada's Softwood Dominance in Kraft Market Pulp

- Canada and its softwood kraft pulps no longer one of the few: many new suppliers, many new grades of market pulp (particularly hardwoods).
- Market pulps increasingly tailored to specific market niches or requirements (increased emphasis on technical sales).
- Market increasingly aware of its requirements and now dictates the types of fibres and paper grades that it wants.
- Huge advances in technology and in equipment (eg closed draw, alternatives in achieving good formation at higher speeds on paper machine, etc.)
- Economics increasingly favour selected integration into papermaking in Canada's kraft pulp industry:
 - (a) trade barriers declining, bigger markets achievable
 - (b) Canada's wood costs rising, no longer it is the low cost producer
 - (c) forward integration offers some producers a means of capturing higher value added

In this study, we conclude that Canada's kraft pulp industry has a viable future. It capitalizes on many of Canada's competitive advantages. It faces, however, some strong environmental pressures and requires major injections of new capital. We also conclude that an increasing amount of Canada's future pulping capacity will be in hardwood and mechanical grades. Frequently, kraft and mechanical pulping will be compatible on the same site. In many other cases, mechanical pulp and paper mills will be independent of kraft pulp supply.

Producers of wood-containing papers may generate a major portion of their own power needs, if the paper mill is integrated with a kraft pulp mill and has a relatively inexpensive fuel supply (hog fuel, pulping liquor). This helps these companies maintain relatively low effective power costs on a finished tonne of paper basis. In addition, due to the large power requirements of these users, they are able to negotiate attractive rates from utility corporations in many regions.

In view of the importance of electrical power supply at competitive cost to the Canadian forest industry, in the development scenario outlined in this study, we provide below a summary of the current situation in major regions of the world which compete with Canada's forest products industry. The reader also is referred to Volume VI of this study.

United States

In general, although stated power rate structures in the pulp and paper producing states are higher than comparable Canadian provinces, most large producers are paying reduced rates negotiated with the public utility companies. Pockets of low cost electrical power exist throughout the US and many of these are quite competitive with Canadian rates (e.g. Newsprint South). Moreover, co-generation potential and wheeling of power also offer attractive economics in some regions.

Overall, however, the existing cost of purchased electrical power in the US is higher than in Canada and this is not expected to change.

Pacific Northwest

In Washington state, the general rates are fully regulated and the public utilities service only local county areas, generating a major portion of their requirements and purchasing the remainder from the major power utility in the Pacific Northwest.

Discounts must be negotiated with the specific power utility and are difficult to obtain. However, some major users, such as pulp and paper plants, are direct customers of the major power utility and reportedly have negotiated discounts from list prices.

It is important in both Washington and Oregon that prospective new forest products plants be located on the existing grid otherwise line extensions and additional substation costs, if required, may be charged to the plant. The surplus power situation which currently exists is expected to disappear by the mid 1990s.

South

Most power production in the Southern US states is from fossil fuels (oil and coal), and nuclear. Therefore, current power prices are significantly lower than the early 1980s, as a result of lower crude oil prices. Most states have a rate adjustment factor built into their pricing structure to account for fluctuations in the price of crude oil.

It is therefore expected that when oil prices resume their upward trend (which we estimate to be the early to mid 1990s) power prices will resume climbing at a far higher rate than in areas where the major portion of power generation is hydro based. The proportion of nuclear power is expected to decline due to the undesirable circumstances surrounding its generation and this scenario favours fossil fuels.

Currently, most pulp and paper production facilities are receiving discounts from listed prices. Some jurisdictions such as Alabama and Arkansas offer significant discounts to entice new business to the state. Some new pulp and paper producers (e.g. Alabama River Pulp) have been co-generating power and selling the excess generated back to the grid. However the southern power utility corporations have resisted purchasing excess co-generated power from companies and some pulp and paper companies feel it is not worth their while to increase production of power.

Northeast

The effect of co-generation is much more apparent in the northeast states. Most companies are receiving some form of negotiated discounts from utilities corporations. Excess co-generated power is purchased by these same utilities corporations, in some cases at far higher than charged rates. This has resulted in reasonable net rates at the mills.

The New England states have purchased power from Ontario and Quebec. However, power exports from Ontario are drying up due to increased local demand. Quebec is expected to continue supplying the area, particularly with the expansion of the James Bay project.

In summary, as far as the US is concerned, while current rates in the US Pacific Northwest are relatively comparable to British Columbia and Quebec, they are expected to escalate in the 1990s as oil prices go up, nuclear power is downplayed and a temporary excess power condition ends. Rates in the US South and Northeast are also expected to increase at an even faster pace since a much smaller proportion of the total power supply is from hydro-generated sources.

Scandinavia

Current rates in Sweden are very competitive with North America. Sweden generates about 50% of its requirements from hydro with the balance from nuclear and fossil fuels. Rates are expected to rise more rapidly than in Canada due to the 1980 referendum to phase out nuclear power generation by the year 2010. In addition, coal-generated power causes environmental problems such as acid rain and is expected to be restricted. Costs at the mills are minimized with the large portion of co-generated power. Such cost savings are expected to grow. A proposed tax on electricity would bring rates to the levels in Finland. However, the pulp and paper industry is protesting the implementation of the tax as it would mean significant increases to operating costs.

Finland generates the major proportion of its power from nuclear sources (approximately 40%), coal, and other fossil fuels and is therefore expected to experience even higher costs than Sweden by the year 2000.

Other Paper Producing Regions

Japan's power rates are up to three times the levels of North American locations and are expected to remain significantly higher.

Brazil and Chile have power rates which compare favourably with North American companies and are expected to continue to be competitive in terms of Canadian or US dollars. This will be helped by virtue of the continually weakening Latin American currencies vis-a-vis the American/Canadian dollars.

Canada's Additional Generating Capacity

In sharp contrast to many other areas of the world, Canada has substantial potential to develop additional generating capacity. A summary of potential projects, some of which are under preliminary development, is provided in Table 2-6.

Table 2-6
Major Energy Project Potential in Canada
 (Selected Provinces and Selected Projects Only)

	Additional Peak Capacity (MW)
British Columbia	
Kemano Completion	520
Peace River - Site C	900
Keenleyside	180-240
Murphy Creek	275
Hat Creek	720-2000
Quebec	
James Bay II	2460
Ontario	
Darlington	3600
Manitoba	
Limestone Rapids	1280

Source: WRA and Published Reports

Over the longer term Canada will compare very favourably with other regions due to the abundance of hydro-generated power produced. BC, Quebec and Alberta are expected to remain particularly competitive and there should be significant advantages for these regions compared with US and Scandinavian competitors.

2.3.3 Canada-US Free Trade Agreement

One of the conclusions of this study is that the traditional engines of growth in Canada's forest industry are in the process of reaching their maximum potential. Specifically, the softwood lumber industry has reached maturity and the softwood market pulp sector is going through an awkward and lengthy transition. This latter sector faces a number of uncertainties. Overall, a major part of the industry, in its traditional product mix, is experiencing market maturity.

New engines of growth are, however, emerging. In Section 1.0, we discussed some of the major new product developments, including recent integration into coated freesheets (including alkaline papermaking capacity), capacity in LWC papers, SC papers, aspen kraft market pulp, bleached CTMP pulps, OSB panelboards and MSR lumber grades. Earlier in Section 2.0 and in Volume III, we identified printing and writing papers as a major growth opportunity for Canada. In addition, it is clear that other resource factors (e.g. low cost power) are very supportive of expansion in Canada's forest industry.

Correspondingly, the timing of the recent Canada-US Free Trade Agreement appears to be very beneficial to the vast majority of participants in the sector. In effect, it provides an opportunity for the Canadian forest industry to achieve a substantial boost to its export efforts by focussing on market opportunities in the US. These are discussed in detail in Volume III.

From the perspective of tariff rates, in isolation, the Agreement has only limited impact on Canada's forest sector. Most are beneficial impacts: a few pose threats to smaller scale, high-cost producers. From the perspective of removing impediments to market access, however, the Agreement holds considerable potential. The large and growing US market is Canada's natural export destination. This is not to demean in any way the considerable growth prospect overseas, particularly in the Pacific Rim. Rather, as Figure 2-58 illustrates, much of the growth in world market demand over the next 20 years is in the US. Particularly in products in which Canada has an existing, or potential, comparative advantage in trade.

Figure 2-58
World Demand Growth Increment: 1985-2010
 (data are rounded)

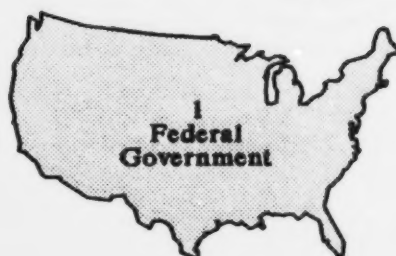
	Newsprint	Printing & Writing Papers	Other Paper & P.B.	Paper Grade Pulp	Lumber	Panelboards
World million tonnes million m ³	17.3 -	66.6 -	65.5 -	84.0 -	- 159.0	- 63.0
U.S. % of Total	36%	27%	22%	23%	15%	17%
USA - 2010 million tonnes million m	+6.2 -	+17.9 -	14.5 -	+19.5 -	- +24	- +11

Source: WRA

In sharp contrast to the highly efficient and progressive Nordic countries, whose forest industries face the resistance of domestic producers in the European Common Market, Canada has an enviable location in relation to its major market (Figure 2-59). Moreover, even the EFTA Preference of Nordic countries in the EEC, which is denied to Canada, does not compare, in terms of market potential, with the prospective expansion of the US.

Figure 2-59

UNITED STATES
 (Population 245 Million)



**EUROPEAN COMMON
 MARKET**
 (Population 325* Million)



* E.F.T.A. = 357 Million

Over the past ten years, the level of investment by new companies from the US in Canada has been very limited. This is not the case with some existing US companies, including Weyerhaeuser, Champion, Boise Cascade, Scott and various newspaper publishers which already hold interests in Canadian newsprint mills. Nevertheless, it is clear that many US companies have preferred to invest domestically in the US, rather than in Canada, in recent years. Moreover, the level of new investment by Nordic companies in Canada has been very limited, particularly those which generally are considered technological leaders (such as the Finns in publication papers and the Swedes in multiply technologies). An exception is Stora which has invested at Port Hawkesbury, but which recently has postponed a planned major expansion at that location.

The potential for new capacity growth, including participation by non-Canadian companies, has increased following implementation of the Canada-US Free Trade Agreement on January 1, 1989. In many cases, these companies can bring technology and an attitude to risk taking which can help Canada realize its market potential.

Over time, US self-sufficiency in specific grades of forest products has varied. In some cases, uncertainty over the realizability of Canadian supply, and the risk of supply disruption, has played a part. In newsprint, for example, US publishers have a preference for domestically located supply sources (e.g. the Usk newsprint mill in Washington State). Nevertheless, US self-sufficiency is likely to decline significantly over the next twenty years in many grades, as discussed in Volumes III and IV.

Currently, self-sufficiency levels in the US are very high (Figure 2-60) in products such as paperboards, coated woodfree grades and tissues. This is not likely to change for these grades: however, there are excellent opportunities in the grades that Canada can produce competitively. These include mechanical pulp based publication papers, bleached mechanical pulps, multi-layer paperboards and printing papers, higher value wood-containing printing papers, higher value lumber products and reconstituted panelboards.

Figure 2-60
US Self-Sufficiency (1987)

	<u>Consumption</u> Million t		<u>%</u> Self Sufficiency
Newsprint & Groundwood Printing	15.6	=	42
Uncoated Freesheets	10.3	=	97
Coated Papers	6.8	=	93
Packaging/Bristols	4.1	=	100
Tissues	4.9	=	98
Linerboard	15.1	=	114
Other Paper/Paperboards	<u>18.1</u>	=	<u>104</u>
Total	<u>74.9</u>	=	<u>91</u>
Market Pulp	<u>5.9</u>	=	<u>125</u>

2.3.4 Technological Trends

The Canadian forest products industry is not as technologically orientated as many of its counterparts, notably Sweden, Finland and some sectors of the US industry. Nevertheless, the availability of new technology and ongoing technological developments, support growth in Canada's forest industry. As noted earlier there are a number of factors that drive investment, such as resources, asset base (i.e. manufacturing facilities), markets, economics (i.e. costs) and technology. For any given investment one or two of these factors typically assume the dominant driving force. The more commodity oriented industries tend to be driven by resources, economics and their asset base (the latter particularly for capital intensive industries). The more consumer and specialty product oriented industries tend to be driven by markets and technology. Within each industry, however, there are commodity oriented sectors and consumer/specialty product oriented sectors. Also within each industry, the product emphasis is shifting away from commodities to higher valued semi-commodities and specialties (see Figure 2-61). This means that marketing, technology and service are becoming increasingly important for the resource based industries, such as the forest products industry.

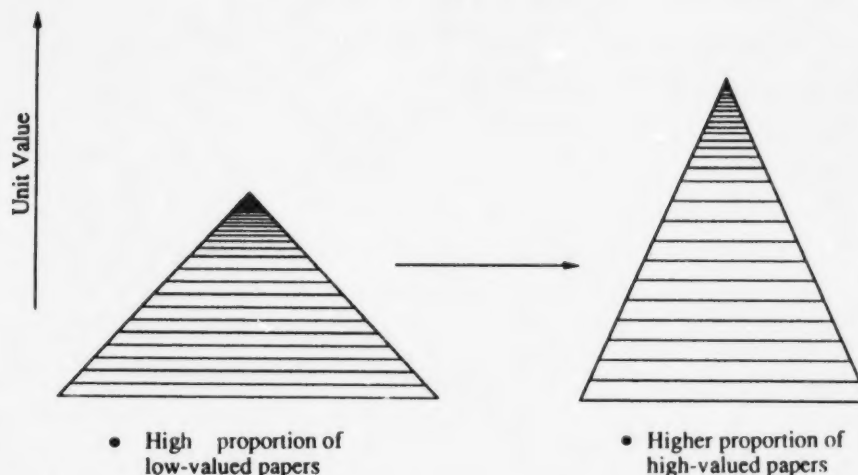
For these industries, process technologies traditionally have been more important than product technologies. With the trend to more products and higher value products, however, and the impingement of technologies and products from competing industries, product technology is now considered more important even for some commodity oriented sectors. Two vivid examples of this trend are the newsprint and linerboard sectors. Present and future profitability for many newsprint and linerboard mills will be tied into this product upgrading and conversion.

Present and Recent Past

Technological trends and innovations can seldom be judged in isolation from other factors, particularly market trends and requirements. The past decade has seen more of the technological innovation tied to market than to resource factors. Some of these market and technological successes have been implemented to upgrade previously unprofitable assets (paper machines); in other cases to exploit previously low value resources (particularly hardwoods). Thus a technological innovation driven by markets can later grow on the basis of being driven by an asset or resource base.

Figure 2-61

1. Trend to Higher Valued Papers



Pulp: The pulp and paper industry has enjoyed increasing technological innovation over the past decade. The focus on pulping technology has been on the high yield pulps, TMP and bleached CTMP. These technologies have been largely resource driven. The TMP process utilizes sawmill residue (wood chips) which was being vastly under-utilized in regions with a high concentration of sawmills (lumber), particularly the Pacific North West region of North America. TMP was designed to replace stone groundwood (SGW) which utilizes roundwood. Initially economics (wood cost) was also a strong driving force. Bleached CTMP was an outcome from TMP but rather than replacing SGW it serves largely as a replacement for bleached chemical pulp or as a distinct product. The major driving force has been product per unit of fibre i.e. the higher yield of bleached CTMP compared with bleached chemical pulps. Bleached CTMP first became commercially available in 1979 and is now starting to be a recognized force as a market pulp.

Table 2-7 shows the capacity growth and the capacity share by country of market CTMP through to 1990.

Also demonstrated in Table 2-7 is the shift in the dominant position of market CTMP capacity from Sweden to Canada. A strong shift in capacity share is often accompanied by a shift in technological leadership. In time technological leadership should shift to the region that has the competitive resource advantages. It would be surprising if Canada was not accepted as the technological leader in bleached CTMP by the early 1990s. Importantly, Canada could not do this if technological transfer (e.g. in tissues) were not available from the US. Again, this demonstrates the importance of marketing and technology as a focus for new investment.

Table 2-7
World Bleached CTMP Market Pulp Capacity
(%)

	1980	1985	1990
Sweden	100	38	22
Canada		32	59
New Zealand		15	5
South America		1	1
Norway		14	9
Finland			4
Other			
Total	100	100	100
 Annual capacity (1,000 metric tons)	 50	 565	 1,598

Commercially over the past decade the significance of TMP and bleached CTMP has vastly over shadowed any technical innovations to chemical pulping. The biggest factor on the chemical pulp scene has been the growth of eucalyptus BKP. This has not been related to new technology but to the absolute level and consistency of quality which has led to a high market demand for eucalyptus BKP. However, recently, BKP has been receiving considerable attention concerning bleaching. The potential danger of dioxins from bleaching pulp with chlorine bleaching agents has drawn attention to toxicity of bleach plant effluent. Oxygen bleaching followed by other non-chlorine containing bleaching could develop into the commercial prominence that many thought would be realized in the 1970s.

Paper and Paperboard: The major change to the paper machine has been driven by the need to provide a higher quality finish to the paper. Market requirements have been much bigger factors than cost driven factors - in fact costs for given grade categories have been driven up by the need for higher quality. However, this has been balanced by the improved lower valued grades being of sufficient quality in some cases to replace higher valued grades. The drive for improved surface properties has resulted in upgraded super calendars, on-machine coaters and matt on line calendars. The new coating and calendaring technology has resulted in many new paper and paperboard grades and has demanded improved quality in the rest of the paper machine (i.e. dryers, press section and wet end). Thus, twin wires, or the add-on top wires to an existing fourdrinier, and new improved head box technology have been installed to meet the demands of paper finishing which requires a uniform well formed sheet.

To meet the paper prices demanded by the market, costs have been reduced by increasing the size of the machine (i.e. economy of scale) for a given paper grade and by reducing the cost of the furnish components. Cleanliness and formation have become bigger factors than strength for the majority of paper grades.

Process and product technological innovation related to paper machines has, to a large degree, been indistinguishable. New calendaring and coating technology has led to new grades of paper and paperboard. This is particularly true of specialty papers in which new coatings can create entirely new products related to very high valued end uses. The Japanese paper industry is the world leader in specialty paper products.

Conversions: The ready trend to higher valued products and increasing number of products and product categories is being driven by end users and impinging products and technologies from competing industries (i.e. electronic and plastics). For converters, who are often the direct customers of the paper and paperboard producer, this has forced them to be much more innovative. Computers and new electronic technology has resulted in many more paper grades and a much higher consumption of printing papers - rather than the opposite of reducing paper consumption which was the original consensus forecast.

A well known example of a major success related to converting technology is Tetra Pak. This technology combines bleached paperboard, plastic film and aluminum foil to provide an aseptic package that has grown more rapidly in the past decade than any other liquid package. About 80% of the substance is bleached paperboard. In this case plastic and metal foil, which can be considered competing materials, complement paper to provide a new, highly desirable product. Composite products have in general been the major technological innovation for packaging over the past 10 years, and have been a major factor in the consumption of paperboard and containerboard. Conversely plastics have been a major factor in the decline of some paper grades, i.e. sack kraft.

In addition to computers and electronics, new printing technologies (i.e. flexography, heat set offset) have been major factors in the demand for new printing papers, even in newsprint, the classical commodity paper grade. Upgraded printing equipment and the demand by advertisers for four colour work has led to the development by the Swedish industry of improved news grade.

Composite product technology has also found its way into tissue and sanitary products - wet strength toweling, super adsorbents in diapers, fibre mixtures for non wovens - all these technological innovations provide continuing growth or at least continuing demand for pulp and paper.

Wood Products: The major product technology changes have related to reconstituted products. Waferboard is a relatively old technology but one which has only recently had a major impact on markets. Other products that are still early in their development cycle are LVL (see Volume IV glossary) and Parallam. In contrast, the major wood product, lumber, has been subject to relatively minor product changes such as MSR, treating and finger jointing/edge gluing.

By far the most important technology changes have related to processing. The use of scanning and computer aided optimization has had a significant impact on productivity and yield. Similarly, profile sawing (as in the Linck technology) and thin kerf sawing have been other important processing technologies -- all of which have been imported from Europe.

There is a belief, however, that we are reaching the limits of incremental benefits through new processing technology based on what is currently viable. Certainly further improvements are possible at any mill but the productivity gains are becoming more difficult to attain. The more futuristic technologies such as laser or water jet cutting are currently being viewed with some skepticism.

Short Term

Over the next five years the world's pulp and paper industry is likely to have a somewhat more commodity focus than over the past five years (an exception to this should be Canada). The US will not be facing the same stiff offshore competition due to the relative shift in currency values, and Western Europe is going through a restructuring which involves acquisitions and mergers of paper companies and convertors (vertical integration). The latter will have the effect of reducing innovation. However, Japan will continue to show significant innovation in specialty papers. The major technological thrust and trends are seen as follows:

Pulp: The quality of high yield pulps is still far from optimum, particularly regarding fibre distribution and optical properties (brightness, brightness reversion and hue). Over the next five years commercialization of multi-stage bleaching for high yield pulps will continue to be implemented and new technology related to improving reversion and hue should be commercialized. This will have the effect of increasing the end use of bleached CTMP, and bleached high yield pulps in general. In particular this will farther erode the division between wood containing and woodfree papers.

In addition to bleaching technology, the technology for high yield pulping of low and medium density hardwoods should develop to the point that a significant number of commercial installations of bleached CTMP/CMP for hardwoods are on stream - both integrated and market pulp mills. Technological innovation in both bleaching and high yield hardwood pulping should result in a significant shift in the growth of high yield pulping compared with chemical pulping.

The shift away from chlorine bleaching agents is likely to accelerate and oxygen bleaching could achieve about 25% of the total BKP bleaching capacity in Canada within the next 5-10 years. The success of cost and quality effective non-chlorine bleaching of chemical pulps as well as the technological innovations associated with high yield pulps will be a major factor in determining the ratio of new chemical pulp capacity to high yield pulp capacity.

For BKP mills that have access to hardwood, the change to specialty hardwood bleached kraft pulps will continue. In Canada this is particularly true in Quebec and parts of Ontario which have mixed hardwoods, and also for the remaining hardwood reserves in the Atlantic provinces. Over the next five years BKP remains the only viable commercialized technology for high density hardwoods.

Technological developments related to new chemical pulping methods, i.e. ethanol pulping, are not expected to have any commercial success over the next five years.

Papermaking: The majority of commercial growth is expected to be in the new paper grades established over the past 10 years -- SC paper, pigmented papers, LWC, premium coated papers, MWC. WRA believes one of the biggest technological factors will be the improvement and commercial growth of layered papers. This is an extension of the multiply paperboard that has resulted in the use of bulky fibres in the middle plies (TMP, CTMP and PGW) and high grade chemical pulps in outer layers.

Development of paper machine technology to provide layered sheets for fine papers is well underway (for tissue it has already been commercialized, i.e. new tissue machines at Scott Paper, New Westminster, BC). This will allow less expensive fibres in the middle of the sheet and provide a better sheet for a given cost.

Coating technologies will improve and the increasing use of pigments and lower cost non fibre components will continue. Canada should start the shift to alkaline papermaking - a technology which is rapidly becoming the norm in Japan and Europe.

Many of the newer grades of paper and paperboard that have been developed over the past decade will drift toward commodity status - this has in fact happened to LWC. New paper grade development is not expected to be as active, particularly in Western Europe, as over the past ten years.

Converting: Development of composite products will continue to be a driving factor for packaging - particularly in North America which is behind Western Europe in this regard. Printing technology and improved printing inks will continue to develop and place a high priority on surface requirements for papers and will result in new standards for existing paper and paperboard grades, much in the same manner as US Today rewrote the standards for newsprint. Again this will be particularly felt in North America.

Wood Products: Apart from the development of improved reconstituted products e.g. MDF faced strandboard and the continued expenditure in optimization in sawmills, a particular development could be in plywood. New technology now permits the use of small lower cost logs for veneer and there are a number of other cost saving technologies. We feel that several Canadian mills will invest in these proven technologies and halve the loss of market to substitute boards.

Long Term

The long term trend will see a refocussing on specialty products. The end users will become more of a factor in setting the product standards for the paper and paperboard industry. To survive and to exploit the opportunities presented by competing or complementary industries a much stronger focus on markets and technologies will be required. Whereas many forest products companies in the industrialized world still survive with a minimum technology effort (process and product development) and will continue over the next five to ten years to grow and prosper through technology transfer, it will be necessary to have a more basic effort in technology to prosper in the longer term. This is discussed in more detail later in this volume.

Fibre makes up a decreasing portion of the material requirement for paper and paperboard. Projecting the present trend to the year 2000 suggest that only 60 to 65% of paper and paperboard will be comprised of virgin fibre. An increasing amount of the remainder will be secondary fibre, but non fibre components (pigments and fillers) will also become increasing significantly. Considering converted products, it is likely that less than 50% will be virgin fibre: ink, plastic, clay, foil, etc., will form an increasing portion of the end product. Thus other industries, most likely higher tech, will become a bigger factor in product development for paper and paperboard. This increasing interplay will require a significantly improved marketing and technology input.

Pulping: Technology will concentrate on developing pulp grades for specific end uses. A far less commodity focus will be required of tomorrow's pulp producers, compared with that at present.

Papermaking: The inclusion of more pigments and other inorganic chemicals plus the stratified and multiply structure with more on-machine functions (such as coating and supercalendering) will require a very highly automated paper machine. The increasing grade diversification on large scale paper machines will also add to the requirements for automation.

Converting: Composite products will become commonplace. Successful paper and paperboard companies will closely monitor and respond to the needs of convertors and their customers (end users). The technological drive to create new products that meet the markets (convertors and end users) requirements will become a significant factor in the management of the paper and paperboard industry. Product lifetime will shorten and force changes to the business culture of the industry.

Wood Products: The ability to design and market lumber and panel products that develop and fit into small market niches will become even more essential as the large commodity super mills continue to improve their cost competitive positions. The smaller mills will adopt a greater focus on value extraction and the manufacture of a greater variety of grades. This trend will demand a more sophisticated approach to automation, scanning, precision cutting and management information systems. Technologies that capitalize on the use of other non wood materials to enhance the wood component will become commercial.

Technology Transfer

Successful approaches to technology change with time. In some cases technology is not a priority, in other cases purchasing technology is the best approach, and in still other cases technological innovation is required. Technology transfer is most effective for regions which are not close to leadership in a given product or process. Thus, it is necessary to know the leadership in given product sectors. The following regions exert technological leadership in the following paper and paperboard sectors.

Table 2-8

Product	Country/Region
Newsprint	Sweden
Printing Papers	Western Europe
Paperboard	Western Europe
Tissue	US
Specialties	Japan

Knowledge of the above is a requirement for any Canadian pulp and paper company striving to achieve the state-of-the-art.

Implications for Canada

We pointed out earlier that the Canadian forest products industry is not as technologically oriented as its counterparts in other parts of the industrialized world. In particular it is considerably less progressive than its major competition in the export market, Sweden and Finland. These two countries are also very dependent on the export market for the health of their forest products industries.

In the short term Canada should concentrate on catching up technologically with Sweden and Finland in those areas where it falls behind today. This requires a healthy attitude towards purchasing of technology - but to be successful more of a market focus is also required. Fortunately for Canada much of the applicable process and product technology is power intensive and, as demonstrated earlier, Canada has the best competitive position in the industrialized world concerning electric power.

Specifically the following technologies and products required a focus over the next five years:

- 1) Improved Newsprint (filled or very lightly coated newsprint for better colour reproduction)
- 2) Wood containing printing papers i.e. LWC, SC and pigmented papers
- 3) Non-chlorinated bleaching of chemical pulps
- 4) High yield pulping of low and medium density hardwoods
- 5) Bleached CTMP, particularly softwood/aspen mixtures
- 6) Specialty softwood and hardwood BKP pulps
- 7) Lightweight and white top linerboard for pre-printing
- 8) Multiply bleached paperboard
- 9) Low cost plywood production
- 10) Lumber scanning and optimising (grade, width, length)
- 11) Thin kerf sawing
- 12) Specialty lumber and panel products and grades

In particular, a higher profile on quality level and consistency of quality is required. This means a significant upgrade in process design and process control.

In the long term, Canada requires a much greater basic research and development effort, particularly on product development. This industry needs a greater understanding of the converting and end user technology. At some time in the future it will not be able to transfer technology from such countries as Sweden and Finland. Product diversification and competition from other industries will dictate a basic technology and marketing effort. This will require a shifting of management priorities, to give increased emphasis to developing technology. Canada's cost structure is unlikely to be competitive with the developing nations, such as Brazil and Chile - thus commodities, such as standard newsprint, market pulp and construction lumber will need to form a smaller proportion of the product mix.

3.0

PROSPECTS FOR CANADA'S REGIONS IN THE MAJOR PRODUCT GROUPINGS

- 3.1 REGIONAL DIFFERENCES AND SIMILARITIES**
- 3.2 CHANGES IN REGIONAL STRUCTURE**
- 3.3 MARKET PERSPECTIVE TO THE YEAR 2010**



3.1 REGIONAL DIFFERENCES AND SIMILARITIES

There are few major forest products exporters which have as many topographical, climatic and timber species differences as do the regions of Canada. Yet Canada's regions also have many similarities. The most important similarity, from the perspective of this study, is that all of Canada's regions share a common need. That is, the need to export. Regionally, and in total, the Canadian market is far smaller than would be required for such a large, world class industry. There is no province in Canada where the forest industry can serve only its own needs and at the same time achieve the necessary scale of manufacturing operations and desired levels of resource development.

In Canada, regional diversity in product profile historically has been due to factors such as differences in timber quality, availability, accessibility, distance from market and cost/availability of other resources such as purchased power. While Canada's regions have many similarities, mainly stemming from the predominance of publicly owned resource, past experience suggests that their goals and correspondingly their future development policies for the sector are likely to be quite different.

The subjugation of the forest products sector to provincial, as distinct from national, goals in Canada is as valid as the approach taken by other major exporting countries such as Finland and Sweden to their own development. Both Finland and Sweden excel at coordinating their respective national policies for development and growth in the sector: however, they have strong national goals relating to the high degree of dependence on exports from the sector, or related sectors such as equipment supply. These appear to take priority over inter-regional, as well as intra-regional, goals.

There is little doubt that, in the primary products sector of Canada's forest products industry, regional social and economic development goals are relevant. For example, infrastructure frequently does not exist to make access and economic development possible in the many remote areas of Canada. On numerous occasions, private sector firms have to incur costs, often for public benefit. Historically, provinces to a lesser or greater degree have participated as a development partner in the process, often going well beyond the resource-partnership role implied by their ownership and administration of natural resources. The same is true in regions of the US and elsewhere, where resource development is a goal.

In the analysis presented in this section, we provide a summary of the detailed analyses contained in Volumes III, IV and V. These detailed analyses examine the realistic potential for Canada, and its regions, in terms of major product groupings.

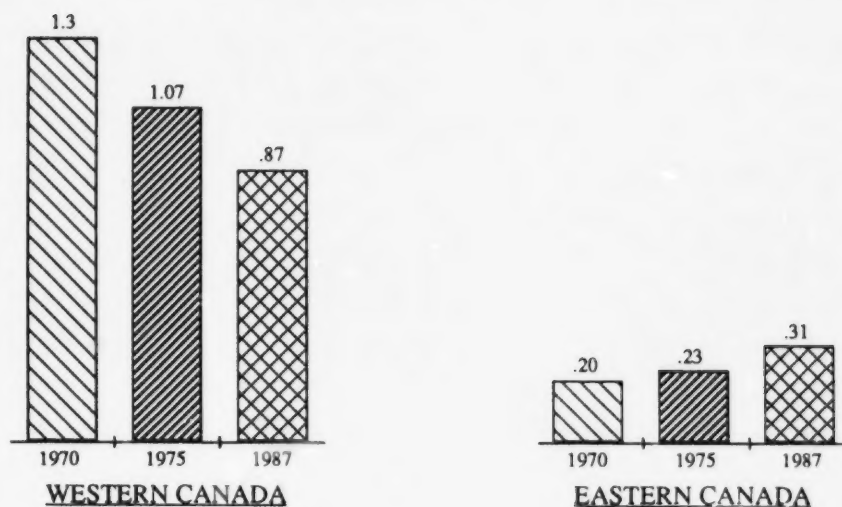
This section is a prelude to Section 4.0 which examines policy issues and options. It will identify other potential constraints, such as capital, technology and business climate, which may preclude realization of some of the opportunities identified for Canada and its regions

3.2 CHANGES IN REGIONAL STRUCTURE

In the following pages we examine changes that have been occurring in the regional industrial structure of Canada's forest sector. We review the balance between the various sub-sectors and their relationship in order to provide a perspective for the remainder of the section.

It has often been said that the forest economy of Eastern Canada is dominated by the pulp and paper sector, and that the wood products sector takes a secondary role. In contrast, it has been observed that the reverse is true in Western Canada. In Figure 3-1 we show that this observation is valid. In 1970, for example, the total value of wood products shipments in the west was equivalent to about 130% of the total value of pulp and paper shipments. In Eastern Canada, the proportion was equivalent to 20% in 1970.

Figure 3-1
Wood Products to Pulp & Paper Ratio:
Western & Eastern Canada
 (\$ Value of Shipments Basis)



Western Canada

Figure 3-1 also shows that a dramatic shift has occurred in the forest economy of the west. In 1970, wood products clearly outweighed the pulp and paper sector. At that time, the ratio of wood products to pulp and paper, on a value of shipments basis, was 1.3 to 1.0. Over the period 1970-87, there was a 71% increase in kraft pulp capacity in Western Canada (Figure 3-2) and a 90% increase in newsprint capacity (Figure 3-3). Despite this, the value of wood product shipments increased by a factor of 5.5 times their 1970 level. The overall result of these changes nevertheless was a relative decline in the supremacy of wood products from its dominant earlier position.

Eastern Canada

In Eastern Canada, the forest economy clearly is dominated by the pulp and paper sector. Today, the value of wood products shipments is around 31% of that of pulp and paper compared with 87% in the West. Nevertheless, the forest economy appears to have become less dependent on the pulp and paper sector. Over the period 1970-1987 there was a 55% increase in kraft pulp capacity (Figure 3-2) in the East. Due to rationalization and structural changes, there was a 25% decrease in newsprint capacity during the same period (Figure 3-3). Nevertheless, as Figure 3-3 shows, net new capacity has increased significantly since that time with a number of new, larger sized, very efficient machines being installed. During the 1970-87 period, the value of pulp and paper shipments has expanded significantly. In particular, the rise in value has been particularly dramatic since the late 1970s. The causes of this include:

- (a) higher product prices for pulp and paper particularly in the current cycle;
 - (b) positive impact of the pulp and paper rehabilitation program of the Federal and Provincial governments;
 - (c) rise in overall capacity in the East, net of shut-downs of older inefficient capacity;
- and (d) increasing level of forward integration.

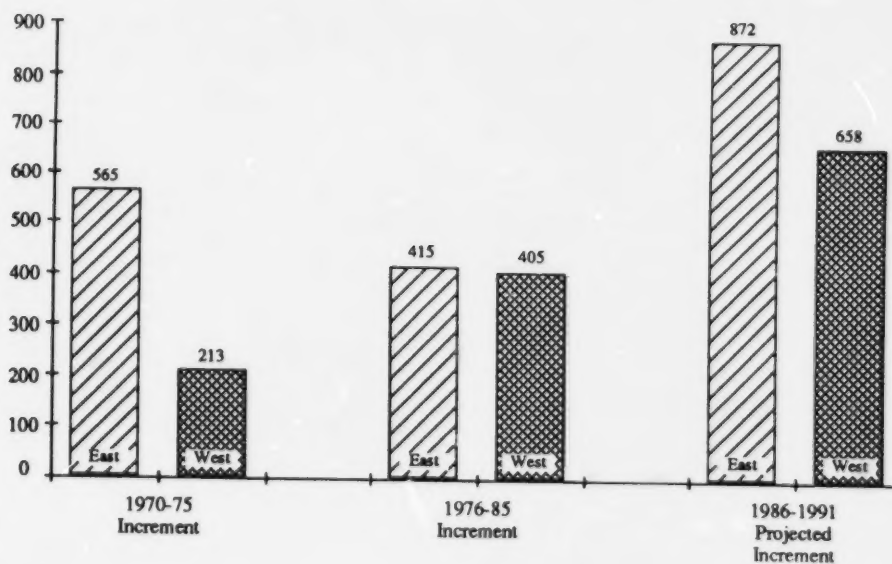
Nevertheless, the value of wood product shipments in Eastern Canada expanded about eight times from their 1970 level and now are fairly close to those of Western Canada.

Figure 3-2
Canada: Regional Growth in
Market Pulp Capacity



Source: WRA

Figure 3-3
Western vs Eastern Newsprint
Capacity Growth
 (000 metric tons)



Source: CPPA

As a result, it is clear that both in Eastern and Western Canada the integration referred to in Section 2.0 has had a dramatic impact on Canada's product-mix on a regional basis.

3.3 MARKET PERSPECTIVE TO THE YEAR 2010

Regional Development Scenarios

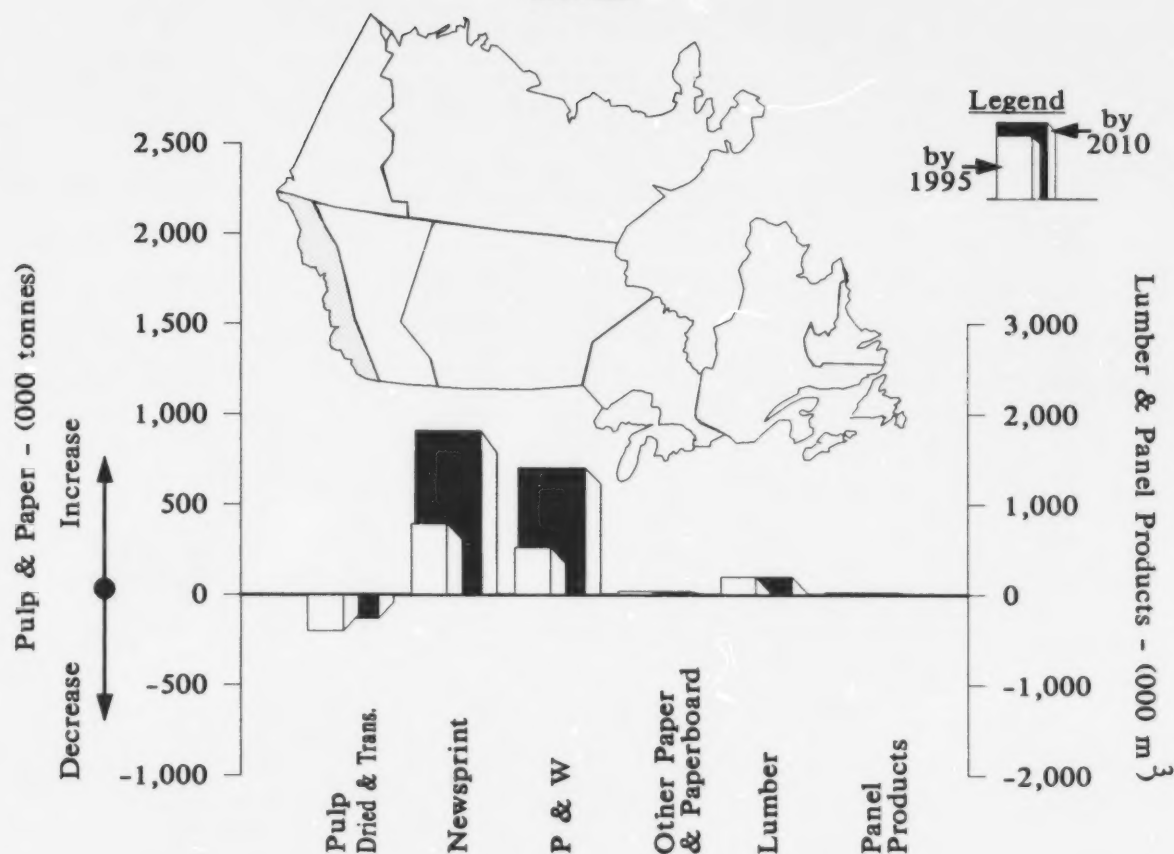
The following scenarios integrate the total analysis conducted within this study culminating in development scenarios by region for both the short term (1995) and the long term (2010). The regions of Canada are not always mutually exclusive. For some products they are interdependent in the sense that fibre and capacity constraints in each region are reflected not only in that region but also can affect the response in other regions as well.

The scenarios are, of course, only scenarios. They represent a body of knowledge and analysis which supports a realistic, plausible response. This does not assume any dramatic shifts in the prevailing investment climate, technology or industry culture. It does anticipate the historical degree of initiative taken in response to market demand forces. The implications of whether or not this is achieved will be examined, as already noted, in Section 4.0. In the following summary, we focus on the longer term to the Year 2010.

BC Coast

Over the next twenty years, the broad thrust of development on the BC Coast is likely to be characterized mainly by new initiatives in newsprint and printing/writing papers. Limited growth is expected in its historical strength (lumber) and an actual decline in dried and transferred pulp is forecast (Figure 3-4).

Figure 3-4
Development Scenario
Product Profile Changes
1995-2010
BC Coast



Source: WRA

The fibre resource on the BC Coast significantly constrains the potential to expand in its traditional way i.e. increased volume of output. With virtually no excess fibre, overall growth is likely to occur mainly as a result of shifts in product-mix, with better utilization of species, such as cedar for pulping, with emphasis on integration and higher value added. Moreover there has been an ongoing shift in the mix of fibre available. High quality sawlog wood in the area is declining while pulp quality timber is increasing.

A considerable quantity of fibre is now exported from BC (mostly logs from the Coast and chips from the Interior) and repatriation of this fibre will improve the overall supply situation. The Coast also receives a considerable quantity of logs and chips which are transferred from the Interior. However, this is a practice which will likely decline in significance, as a direct function of demand and price, as overall fibre supply in the province becomes even tighter.

The most plausible scenario is that sufficient pulp quality fibre for newsprint and printing/writing will be available, augmented by the release of some existing fibre through BKP market pulp capacity conversions and a recapture of chips eventually exported. The absence of hardwood on the Coast will inhibit the ability of existing BKP mills to integrate into printing and writing, whether this is woodfree paper or LWC. Nevertheless, there will be opportunities for capacity in these grades. The older BKP mills will need significant capital to maintain viability and it is possible that, with the prospect of eventual shutdown if they remain stand-alone, most will undergo rationalization with upgradings and conversions to higher value products, as a mix of market pulp and paper/paperboard products produced on the same site.

The decline in high quality old growth sawlogs is a serious constraint to volume growth in Coastal lumber operations. The difficult terrain for much of this wood also makes it relatively higher cost and physically more difficult to exploit. While minor growth will undoubtedly occur, specialization and higher value added will become the major focus for lumber producers on the Coast. The particular species available on the Coast (e.g. cedar, hemlock, Douglas fir) lend themselves well to this strategy.

There are some existing newsprint machines which are smaller scale and these will continue to offer opportunities for conversion to higher value publication grades, or new state-of-the-art capacity as supermills. This could be achieved in phases with elimination of two to three older machines, replaced by a new machine producing, for example, SC papers or coated publication. At least two such conversions are expected by 1995 with an additional two to three expected by 2010. With two new newsprint machines already announced on the Coast, additional new capacity is very unlikely in standard grade for the 1995 scenario, but more capacity is expected by 2010.

In terms of percentage increase, growth in both newsprint and printing and writing is primarily driven by Asia-Pacific markets. With more than half of the increment of growth destined for this market, it will still represent the largest market in volume terms, for many years. The remainder will go into the US West market. This represents quite a dramatic shift from current market emphasis for both products. Printing and writing shipments to either of these export markets are small now in any case. Current newsprint shipments are mostly into the US market with the Asia-Pacific market accounting for only 20-25% of the total.

The reduction in market softwood BKP capacity (but not total pulp production) will be partially offset by some additional CTMP, but most of this is expected to occur beyond 1995. Modest integration should occur by 1995, further reducing dried and transferred pulp shipments in the short term.

The addition of higher value added lumber capacity is expected to occur in the short term scenario only, then stabilize beyond 1995. This reflects the increasingly constrained availability of sawlog quality wood referred to previously. Net commodity grade sawmill capacity on the Coast eventually will decline.

Overall, the outlook for the BC Coast is very encouraging, assuming that its market and technological potential in papermaking is acted upon, and if environmental challenges can be met. The shift to higher valued publication papers, such as filled sheets, SC and LWC, is supported by the market outlook and by the capability of the existing companies. Coated mechanical paper technology is readily available to companies such as MacMillan Bloedel (through KNP); Fletcher Challenge Canada (through Blandin); Skeena Pulp (through Repap); Howe Sound Pulp (through Oji) and to Eurocan (via Enso).

Moreover, there is support in some cases also as a result of balancing of integrated operations at various locations with their respective fibre sources and competitive positions. Specifically, the product-mix of Coastal, Interior and other operations can be optimised, for some companies, through fibre (including pulp) exchanges and grade shifts between facilities within the same corporate group.

Newer technologies, such as the higher valued uncoated publication papers (filled, pigmented, and higher grades of SC), are readily accessible, although these have yet to be fully exploited in the area. Application of CTMP technology, while only limited in the area present, could be acted upon readily. The area is heavily oriented to using its base of softwood kraft fibre (e.g. in Western North America, many grades of tissues have an unusually high kraft content). Overall, the major constraints to growth on the BC Coast are unlikely to be related to fibre and are most likely to depend on attitudes to investment and new technology.

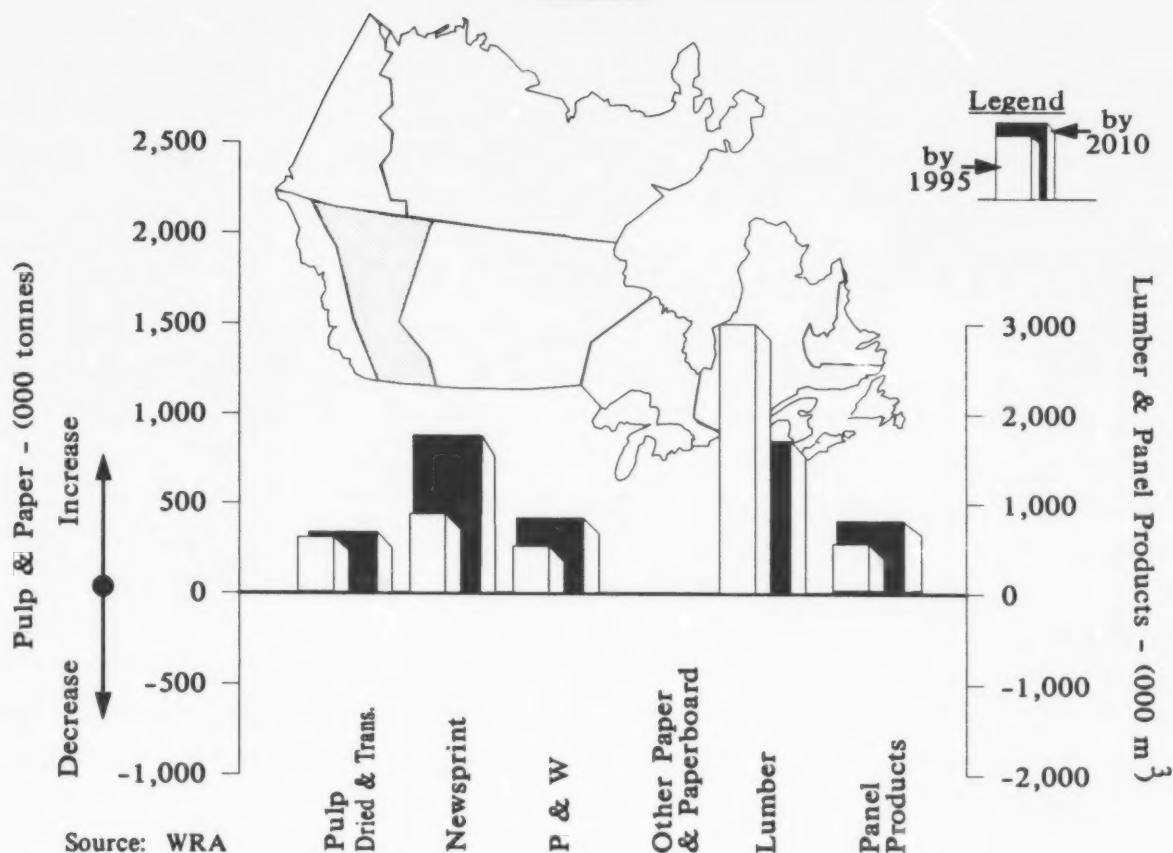
BC Interior

The Interior fibre situation is similar to the Coast in that sawlog quality timber is at, or close to, its limits while there is some surplus (possibly quite significant) of pulp quality timber. In addition, the Interior has a meaningful amount of unused hardwood. The Interior, however, suffers some freight cost disadvantages, particularly to the Asia-Pacific markets. This disadvantage is only partially offset by lower wood costs. The same disadvantage is still present but less significant for lumber, where the markets are primarily south and east.

The situation is one where there is a greater underlying potential for commodity lumber than for pulp and paper in the Interior, but a fibre supply and market situation that encourages just the opposite. Furthermore, the sawmills and pulp mills in the Interior are quite modern and efficient, with little or no redirection of fibre expected through shutdowns, at least in the short term scenario. The economic unit size for mills is still larger in the Interior due to the net freight cost-related disadvantage.

Lumber output is expected to continue to increase modestly in the short term (1995) in response to market demand, straining the limits of fibre supply. This could also mean some repatriation of logs currently shipped to the Coast. A reduction in good quality sawlogs in the long term scenario will mean a reduction from this high point by 2010 (Figure 3-5). This will be accompanied by a move to value added lumber products as on the Coast, but without the advantage of the potential high value wood species of the Coast.

Figure 3-5
Development Scenario
Product Profile Changes
1995-2010
BC Interior



Pulp output is expected to grow, but much of this will be CTMP, capitalizing on the hardwood resource. The current surge in CTMP capacity and environmental regulations in some areas, however, could delay some of the additional capacity until beyond 1995. As on the Coast, CTMP integrated with kraft pulp, could help make currently non-integrated and high cost kraft market pulp capacity viable for integration into paper or board making and possibly could assist CTMP installations environmentally.

The growth in newsprint will be primarily in response to the ripple effect of growth potential on the Coast that could not be fully satisfied because of fibre supply constraints, plus the ability to locate newsprint capacity away from its traditional ties to kraft pulp. One mill - integrated with pulp - has already been announced in the Interior (Mackenzie). Another mill should be expected before 1995 (which may not be integrated with captive kraft pulp). Printing and writing paper capacity growth will be adopted rather gradually in this region where commodity products are so dominant (market BKP and lumber account for over 90% of the fibre consumption in the Interior). This will emerge through the integration of pulp mills and a shift to greater use of the region's abundant low-density hardwood fibre i.e. aspen.

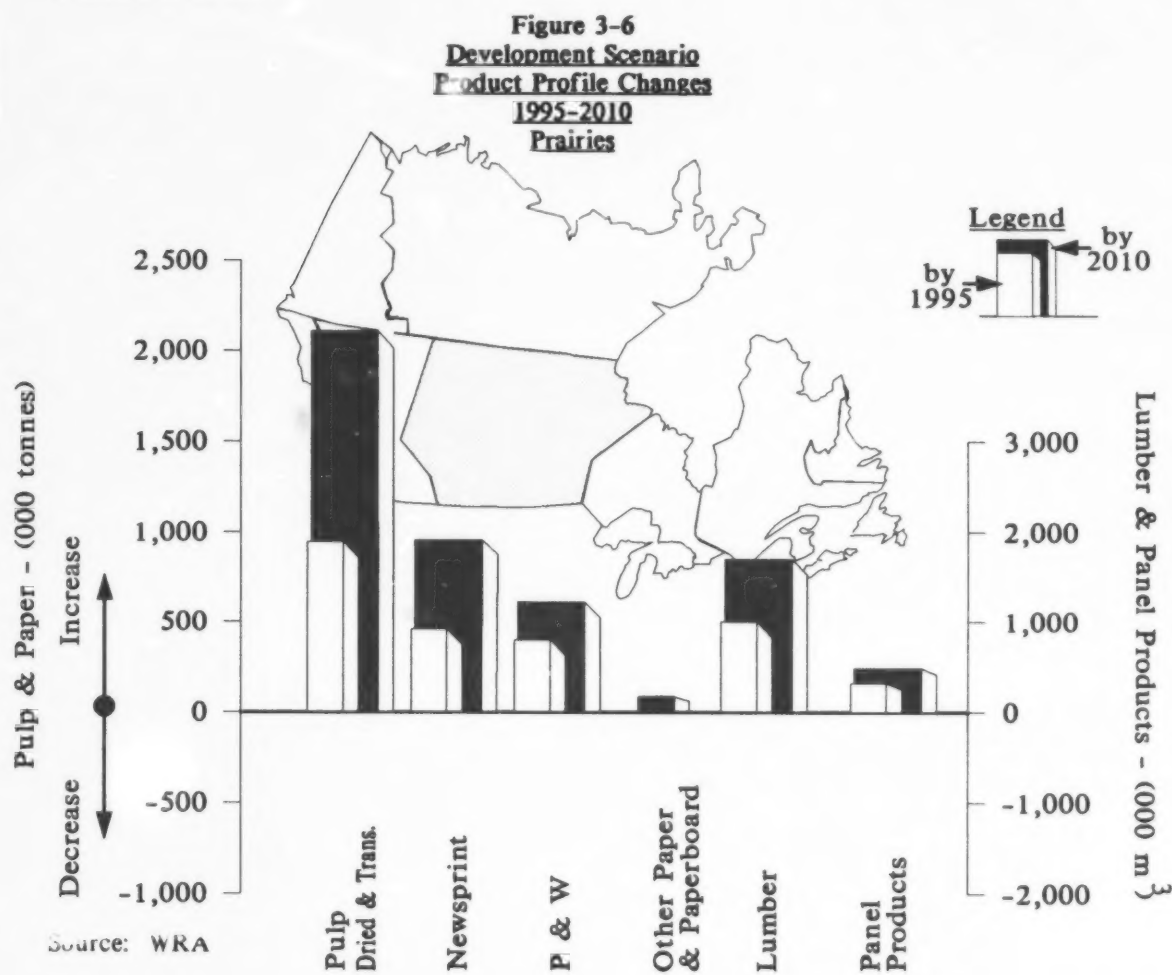
Growth in panels will be realized but most of this will be OSB rather than plywood because of the aspen resource availability.

For the BC Interior, the short term outlook to 1995 is favorable and the potential beyond this is very significant. To a large extent, performance will depend on achieving a successful shift from a commodity grade lumber and softwood market pulp driven psychology. The response of the independent sawmilling sector to this will be a key factor. Considerable progress already has been achieved, in this regard, through initiatives such as Fibreco's CTMP mill at Taylor. Other mills (aspen-softwood) have been proposed. The region's hardwood resources could be instrumental in achieving this shift. Moreover, many existing pulp companies have access to papermaking expertise.

Prairies

The Prairies represent a major growth potential for Canada. Capacity growth that would normally have occurred in the east and west in response to market opportunity (but cannot, due to fibre and other constraints) is most likely to converge in the Prairies. Freight disadvantages ultimately will limit the overall potential to overseas markets and to the east and west coast. Significant growth should occur in the major product segments focusing on the large and growing US markets.

Fibre characteristics will shape, rather than limit, growth, with the possible exception of lumber. The availability of sawlog quality timber is limited. Lumber will grow significantly (Figure 3-6) but not sufficiently to compensate for unsatisfied potential from BC.



The fibre surplus is about 50% low density hardwoods which will cultivate growth in BHKP and CTMP pulp more than newsprint or printing and writing papers. Including the two major BKP mills (Champion-Huton and Daishowa-Peace River) and the one CTMP mill (Millar Western - Whitecourt) already in progress in Alberta, new expansion in pulp will exceed a million tones by 1995 and over two million by 2010 (Figure 3-6). About half of this expansion will be mainly aspen-softwood CTMP, with the BKP component heavily weighted towards the hardwood.

Printing and writing papers will grow from nothing to over 600,000 tonnes, in part because the area will pick up some of the demand that might otherwise be satisfied from BC, Ontario and Quebec, if fibre constraints were less acute in these regions. In addition, the Prairies have an advantage in the suitability of aspen for higher valued end use printing papers. In addition, Alberta in particular has been very active in developing a much broader forest sector base. Newsprint will grow to satisfy most of the market-led demand indigenous to this region (i.e. Canadian and US markets) but is not expected to overcome shortfalls from other regions, due partially to the lesser suitability of fibre for newsprint, given current technologies.

This capacity growth in the Prairies will not occur readily. The basic infrastructure links (transportation and energy) are not in place for a great deal of the exploitable fibre locations in the region. This increases the overall investment costs and involves commitment and financial contribution from a wider range of parties.

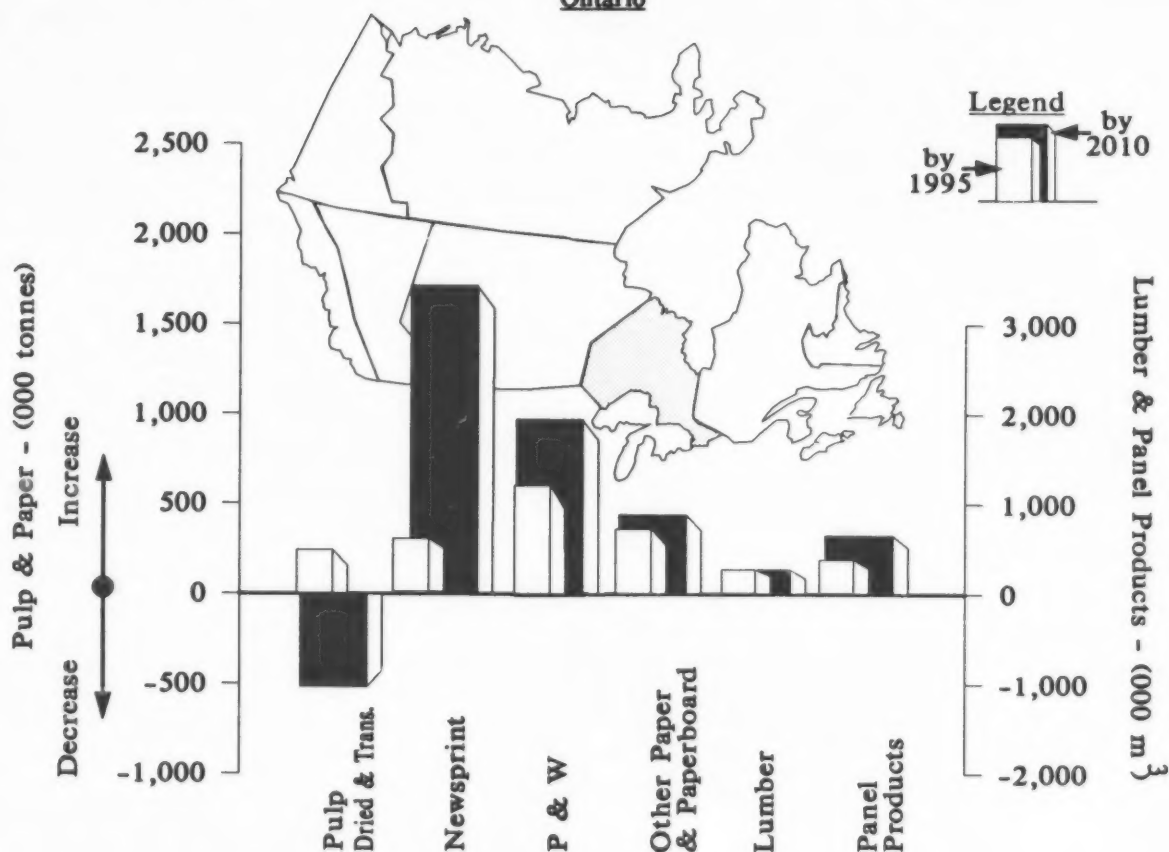
Investment in this expansion most likely would have to involve financial participation from public agencies and foreign joint venture partners. Alternatively, there are a few situations where existing mills have been, or are likely to be purchased at a competitive price and provide a good basis for this expansion. Both will tend to bias the investments towards the commodity end of the product spectrum, a factor which is considered in establishing the levels of newsprint and printing and writing combined in the development scenario.

There may be exceptions to this where, for example, a company has a particularly strong technological and marketing position, such as Weyerhaeuser's current expansion in uncoated freesheet papers at Prince Albert. These grades will be aimed at the US market.

Ontario

The most likely development scenario that we envisage in the case of Ontario is shaped heavily by fibre supply limitations in Quebec. In addition the scenario is determined by Ontario's own indigenous situation with apparent fibre surpluses. The long term development scenario calls for dramatic growth in newsprint, modest printing and writing and lumber growth and a decline in market pulp. Panel products will see moderate growth in the long term (Figure 3-7). Of all Canadian provinces, the potential of Ontario is immense.

Figure 3-7
Development Scenario
Product Profile Changes
1995-2010
Ontario



Source: WRA

A significant portion of the assets in Ontario are aging facilities in need of conversion to more specialized products or shutdown. Pulp mills are in reasonably good shape, but this is the case for only a few selected newsprint and printing/writing mills. Lumber mills are generally the most vulnerable, characterized by many very small mills, many still producing commodity lumber products. Ontario does have some unused softwood fibre resources (albeit fiercely debated on how much and for how long) and significant hardwoods.

These circumstances would point towards significant integration of pulp mills and conversion of newsprint mills into printing/writing, together with rationalization in the sawmill industry. The situation in Quebec has the effect of biasing Ontario's development more in the direction of newsprint and less toward printing and writing.

The softwood deficit situation in Quebec will tend to push for the release of softwood in Ontario to replace the newsprint capacity being converted to printing/writing in the Quebec scenario. This softwood release will come through increased competition for softwood with the sawmill industry, forcing more rationalization in the sawmill sector. Also, the higher cost of wood and smaller trees (lower sawmill yield) will make it increasingly difficult for Ontario sawmills to compete with the efficient BC Interior producers. The same trees will allow efficient newsprint production, however, if the mills are modern and efficient.

Many of Ontario's existing newsprint mills, as in Quebec, are small and must be converted to printing and writing or other grades to compete. This will push the printing and writing development more in the direction of mechanical-based rather than woodfree papers, although BKP integration will also play a meaningful role in the printing and writing paper scenario. This assumes upgrading of existing BKP capacity in order to achieve higher profitability through integration. In addition, significant expenditures related to environmental demands may be required, as discussed elsewhere in this volume.

The net effect will be a move to convert existing newsprint operations into printing and writing (either through conversion or new machines) using more hardwood and releasing some softwood in the process. Pulp mills will move towards more hardwood BKP and some integration, but again, releasing softwoods. The release of softwood from existing operations, together with an upward strain on softwood supply, will feed the newsprint growth.

The timing of this development in Ontario will be pushed into the long term due to the magnitude of the structural shift involved. Pulp production is expected to grow in the short term as existing producers push productivity gains. Some CTMP or PGW capacity is also realistic in the short term, albeit partially hardwood-based. If it is CTMP, it will likely occur in conjunction with the sawmill industry as it seeks mechanisms by which to sustain increasingly vulnerable sawmills. Clearly, this could offer opportunities for new players in the industry. The high presence of mixed hardwood/softwood stands makes this collaborative effort a logical one from the viewpoint of practical fibre utilization.

Overall, while the market-driven outlook for Ontario is very favorable, the level of growth achieved will depend in part on resolution of uncertainties over fibre supply and related issues of resource costs.

The structure of the industry, and its access to technology, are well suited to growth. Many existing companies such as Abitibi, Great Lakes (Canadian Pacific Forest Products) and Boise Cascade (Canada) have the necessary expertise. In specialty paper-making areas, companies such as E.B. Eddy have developed high value added products niches. The location of the province, vis-a-vis the large US market, is very favorable. Much will depend on the overall climate for investment.

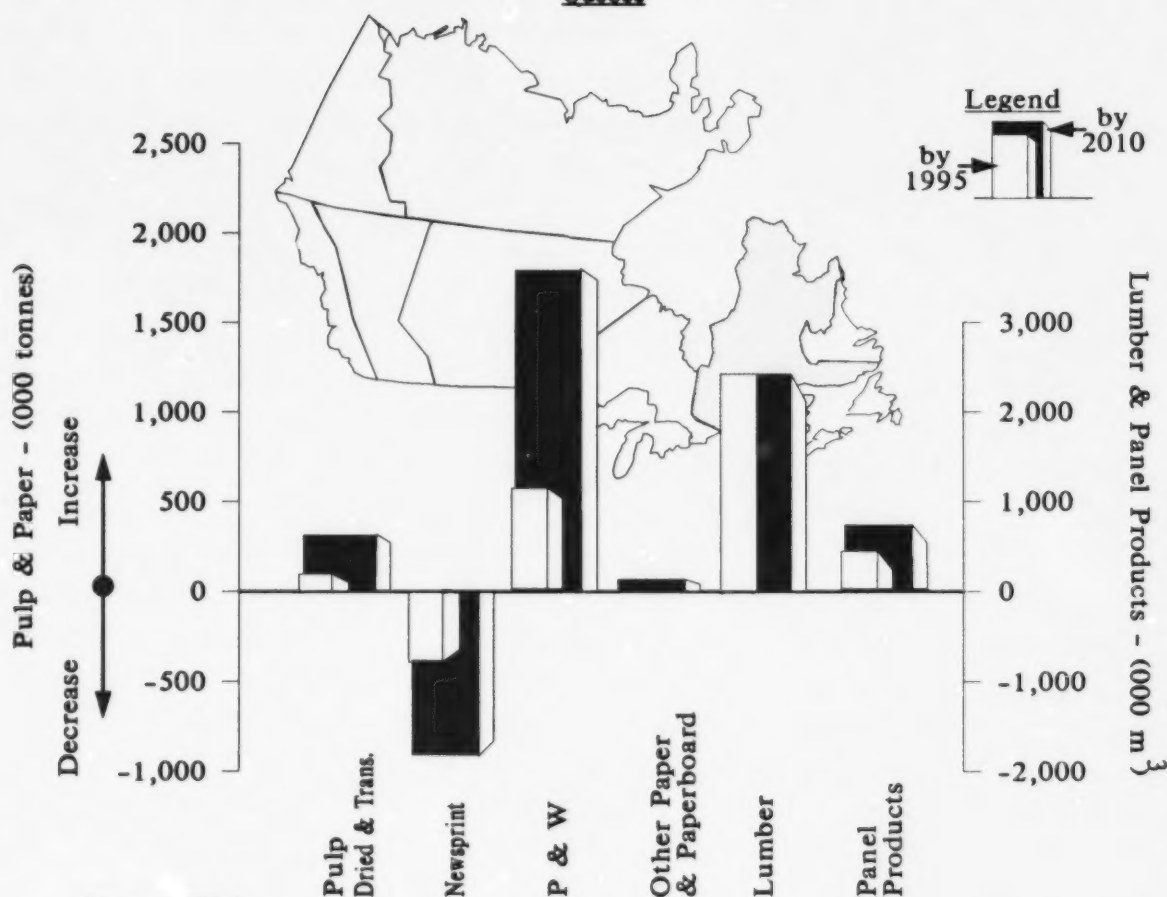
Quebec

The structural changes to the Canadian industry as envisaged by this development scenario are most dramatic in Quebec. This is due to a combination of existing facilities, resource position and in our view, an enlightened provincial policy towards sector development. Many of the facilities in all product segments currently are aging and smaller scale. There also are selected new, large facilities in newsprint and printing and writing. This results in a wide range of sizes and types, even within the same product group. The softwood resource is already over-committed (with the possible exception of some pockets of surplus) while the hardwoods are in a surplus position. The unused hardwoods are high density hardwoods which, to date, have been used mostly in BHKP operations. As a consequence, virtually no additional growth is practical without significant structural change. On the other hand, these structural shifts would result in an exceptionally strong industry in Quebec. The newsprint industry would be totally modernized and a high presence would be achieved in the printing and writing sector. Lumber and pulp operations would be improved through retirement of smaller uneconomic capacity and rationalization of units into larger, marketing orientated groups.

The development scenario calls for a significant net reduction in newsprint capacity, modest reduction in pulp output and a major increase in printing and writing capacity (Figure 3-8). In total, an overall increase in the value of forest products output and improved sector stability is expected. Many small newsprint mills will either be converted to printing and writing or shut down. Significant rationalization of the sawmill industry should be expected but small production gains are anticipated. Total BKP output should actually increase significantly, based on hardwood. BKP mills will become even more integrated than they are now, however, with a net reduction in dried and transferred pulp in the short term.

The strategic driving force behind these shifts will be the incentive to leverage the available softwood. This can be achieved by using it in products that accept a combination of both softwood and hardwood (primarily printing and writing) thereby increasing the total output.

Figure 3-8
Development Scenario
Product Profile Changes
1995-2010
Quebec



Source: WRA

The timing of conversions from newsprint to printing and writing papers, unlike Ontario, is expected to be more gradual. The growing demand for printing papers, combined with the existence of many small unprofitable newsprint machines, provides motivation for conversion. Whether the producer is motivated offensively or defensively, these circumstances can justify the conversion of existing paper machines to higher valued grades. The Quebec industry is already more progressive in this regard than other regions within Canada with significant conversions in place (Consolidated-Bathurst, Grand-Mere, Abitibi, Kenogami, etc.). The current surge in newsprint capacity is also making the older and smaller machines even more vulnerable than ever.

BKP integration is expected to occur in the short term for many of the same reasons, and saturation in integration may occur early in Quebec. New hardwood-based capacity should actually increase dried and transferred shipments in the long term, however, some of this will occur through increases in CTMP or other mechanical pulp capacity. The availability of low density hardwoods is limited, however, which could eventually constrain this growth. Technology advances, however, are expected to permit greater mechanical pulping of medium density hardwoods in the longer term.

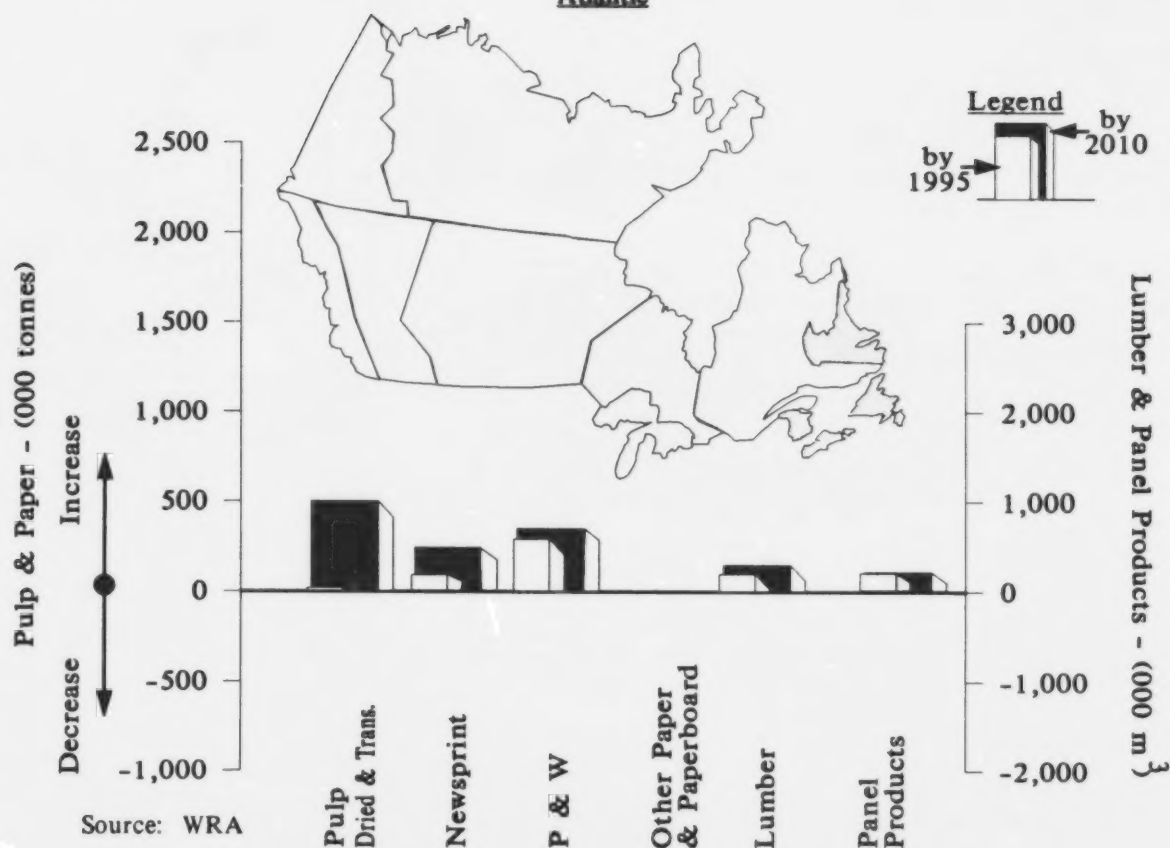
The outlook for newsprint produced in Quebec justifies the modernization of more of Quebec's existing older machines. It also creates pressures to convert newsprint capacity to printing/writing papers. Europe will not provide much additional opportunity for newsprint in the future and growth in the Northeastern states will be among the lowest in the US. Also, the small scale of newsprint machines, combined with the demand for printing/writing, will encourage significant conversions, without regard to fibre constraints. The growth potential for printing/writing eventually is limited by market demand as well, of course. Quebec cannot expect to continue to increase its market share, beyond the levels discussed, based on its competitive cost and quality position.

The short term demand considerations for panel products delays significant additional capacity in Quebec beyond 1995, figuring that capacity increases in Ontario and the Prairies were more logical. This is due, in part, to the current short term overcapacity situation. The low density hardwoods used in OSB are also more plentiful in Ontario, helping to defer additional panelboard capacity in Quebec to beyond 1995.

Atlantic

There is less scope, or need, for significant change in Atlantic Canada compared with other regions. The historical offshore markets in Europe and Latin America will not provide a market-led opportunity. Although pulp mills in the region are relatively small scale, newsprint mills are reasonably modern. The development scenario anticipates modest conversion of the older newsprint capacity to printing and writing. It also anticipates some additional integration of pulp mill output (Figure 3-9) with papers, paperboards or tissue.

Figure 3-9
Development Scenario
Product Profile Changes
1995-2010
Atlantic



Little incremental fibre resource is available for exploitation. New Brunswick does have some high density hardwoods which are the basis for additional BKP capacity in the long term. Additional market mechanical capacity (CTMP) is also considered plausible, based on a mixture of low and medium density hardwoods. Moreover, there is an active potential for alcohol pulping technology, as this develops and can be applied to hardwoods over the longer term.

Only modest gains can be expected in lumber as small landholders (much of the fibre resource in this region is privately held) release marginal quantities of softwood. The expectation of modest panelboard growth is based on the adequate level of recently installed capacity. No further growth is expected due to other demands on the resource.



4.0
ISSUES & OPTIONS

4.1 FORMAT OF SECTION 4.0

4.2 INVESTMENT ISSUES

- 4.2.1 Forecast of Future Spending Requirements
- 4.2.2 Discussion of Capital Spending Patterns
- 4.2.3 Financial Constraints
- 4.2.4 Investment Policy Options

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- 4.4.1 Canada's Export Role
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4.5 THE FIBRE CONSTRAINT: AN ALTERNATIVE PERSPECTIVE

- 4.5.1 Timber Supply
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4.1 FORMAT OF SECTION 4.0

In this section, we present a summary of the major policy issues and options facing Canada's forest product sector. The focus is on the question of what ways are open to Canada to achieve the full potential identified elsewhere in this study. It was pointed out earlier that the industry has an important position in world forest products trade. Moreover, that it already has a strong momentum that inevitably will carry it forward with further growth and prosperity.

Nevertheless, it should be clear from the discussions so far, that considerable additional opportunities exist for achieving strong growth in manufacturing capacity and exports compatible with a healthy environment and meeting regional goals. Earlier, we discussed some of the major potential constraints which could impair the sector's ability to achieve these opportunities.

In this final section, we identify some policy issues involved in exploiting the market opportunities which we believe to be available to Canada. Notably, we discuss four sets of issues:

Investment Issues (Section 4.2)

Technology Issues (Section 4.3)

Market & Trade Issues (Section 4.4) and

Resource Issues (Section 4.5)

In addition, we identify some areas for possible public sector initiatives in overcoming potential constraints to growth related to these issues.

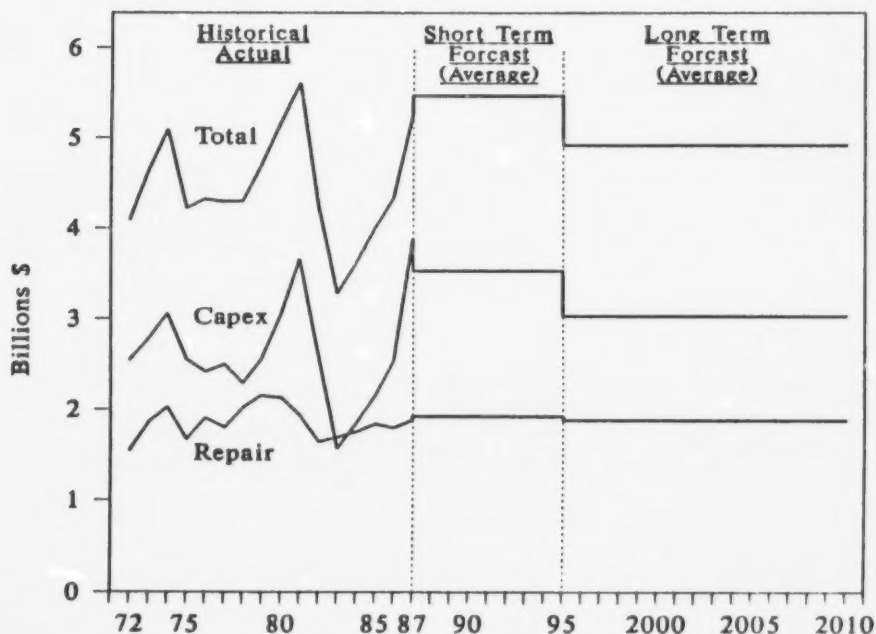
4.2 INVESTMENT ISSUES

The magnitude and form of capital investment in the manufacturing industries is the acid test of whether or not Canada's forest sector will achieve its full potential over the next twenty years.

4.2.1 Forecast of Future Spending Requirements

The development scenario presented in this report will require significantly increased capital spending (capital plus repairs) over the short term (1988-1995 inclusive) amounting to almost 44 billion dollars, expressed in constant 1986 dollars. In addition, significant levels of spending will be required to the Year 2010, if the growth opportunities open to Canada are to be achieved. Figure 4-1 relates projected spending (to the Year 2010) to historical data, expressing all data in constant 1986 dollars. This refers to total spending by the sector.

Figure 4-1
Forest Sector
Historical and Forecasted Capital Spending
 (1986 Constant Dollars)



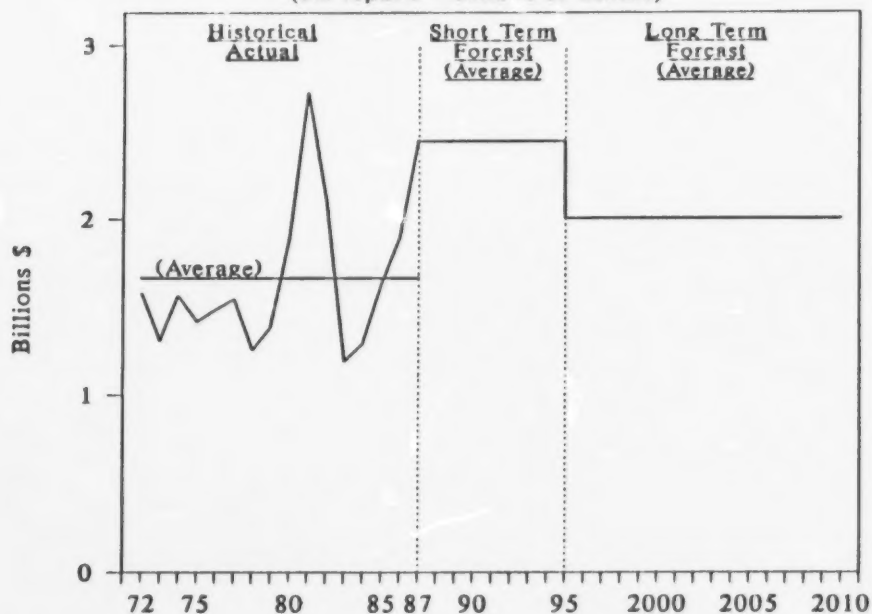
Source: Statistics Canada, WRA

The short term total spending (to 1995) of about \$44 billion compares to about \$35 billion for the most recent eight year period expressed in constant 1986 dollars, or about 23% higher than this most recent experience. Despite the downturn in spending earlier in the 1980s, the 1980-87 period approximates the average spending since 1972.

Short term spending, as shown in the figure, has been accelerated to take into account the current period of catch-up spending for modernization as well as new capacity expansion, following the very low levels of the early to mid 1980s. Virtually all of the catch-up increase is for capital items rather than repairs on which companies typically do not compromise. The long term forecast assumes that spending will settle at a lower level, but still 10% higher than historical spending on an ongoing basis. In the longer term forecast, the pace of modernization moderates towards the end of the forecast period as capacity expansion slows and greater emphasis is placed on repair and upgrading spending at existing sites.

The shift in spending is likely to be most dramatic in the pulp and paper sector. The increases are related to historical capital spending (i.e. excluding repairs) in Figure 4-2 for the Paper and Allied sector in the Statistics Canada data.

Figure 4-2
Historical and Forecasted Capital Spending
Paper and Allied - 1986 Constant Dollars
 (ex. repairs - billions of dollars)

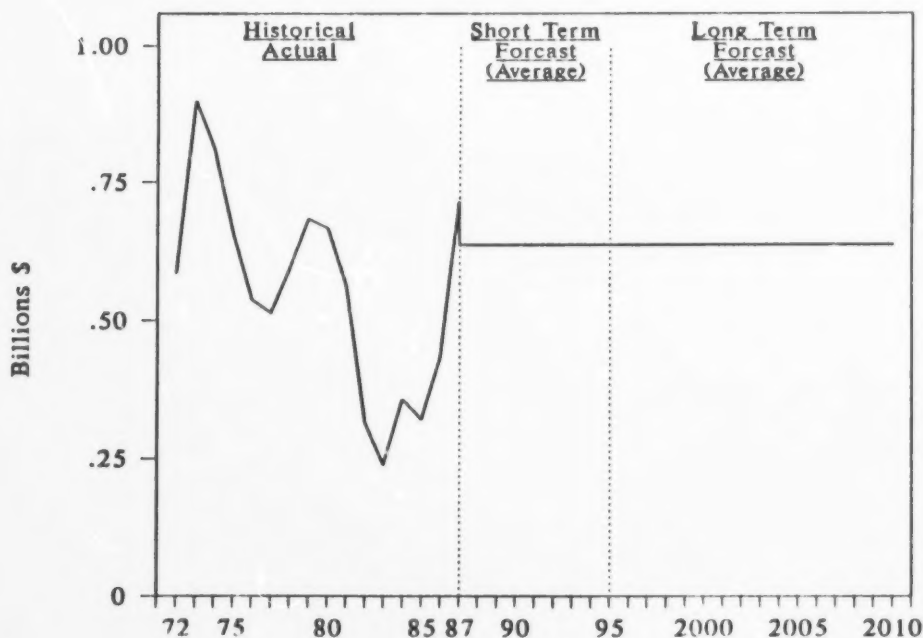


Source: Statistics Canada, WRA

It is important to note that the \$2.5 billion in average annual spending which we forecast is almost 50% higher than the historical average. Even the long term forecast represents spending which is 20% in excess of the historical pattern.

Capital spending for wood products declined very sharply in the 1980s under severe cash flow problems in depressed markets. The outlook for lumber in the development scenario presented in this study is for new capacity to develop only marginally but it is expected that some new mills will also be needed to replace the closure of non-viable mills. We forecast that this activity, in addition to considerable investment in modernization and process technology, will require that long term average spending must move back to levels more characteristic of the 1970s (Figure 4-3). The average over the short term is expected to be much the same as the longer term trend, although higher spending is likely over the next several years, followed by a decline in the early part of the 1990s in response to anticipated economic cyclicalities.

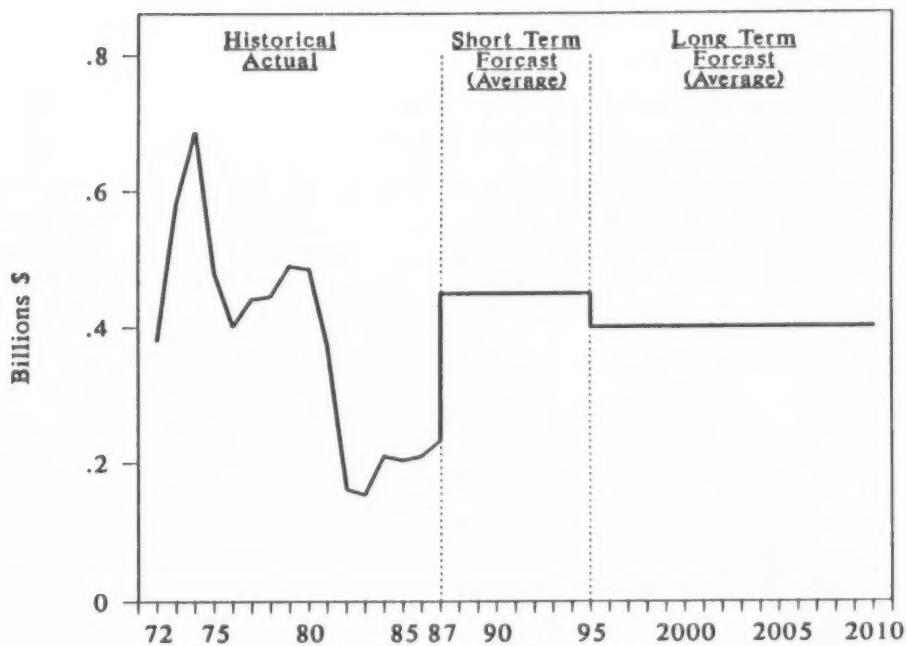
Figure 4-3
Historical and Forecasted Capital Spending
Wood Products - 1986 Constant Dollars
 (ex. repairs - billions of dollars)



Source: Statistics Canada, WRA

Spending on capital items for the forestry sector also fell dramatically from historical levels, and unlike the other sectors has not returned to normal spending in the last 10-12 years (Figure 4-4).

Figure 4-4
Historical and Forecasted Capital Spending
Forestry - 1986 Constant Dollars
 (ex. repairs - billions of dollars)



Source: Statistics Canada, WRA

A possible explanation for this could be an increase in the use of leased equipment, causing a distortion in the statistics. Spending in this sector undoubtedly also suffered during the early 1980s recession.

Overall these projections indicate capital and repair spending requirements in the future which are well in excess of historical levels, in real terms. The current cycle in spending is extremely buoyant, but has been assisted significantly by special factors which are discussed in the next section.

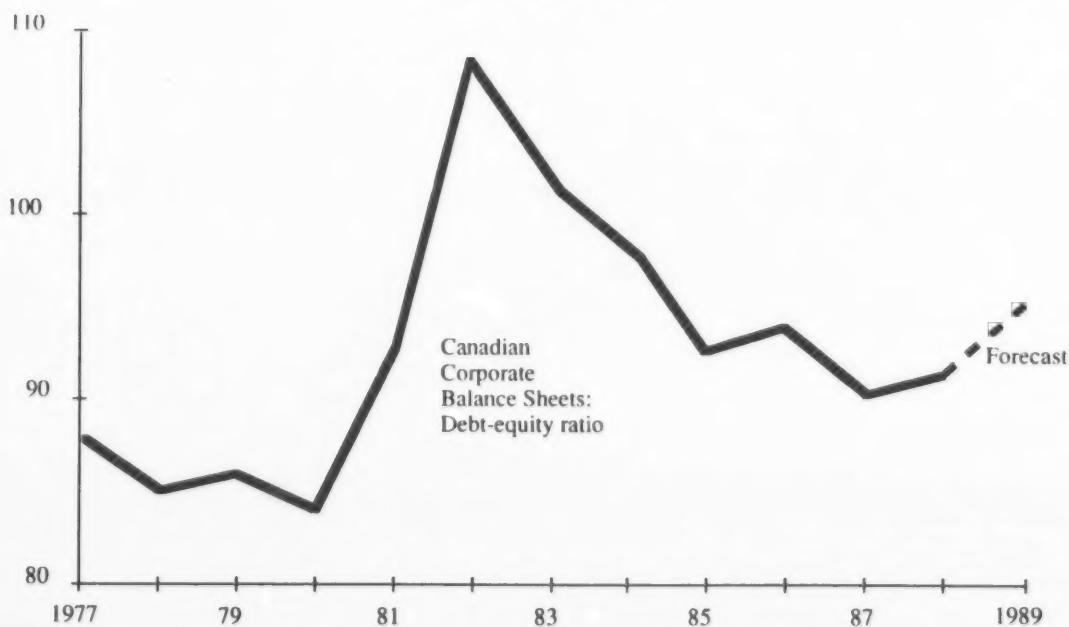
4.2.2 Discussion of Capital Spending Patterns

Based on historical patterns of behaviour, the sector is likely to spend significantly on upgrading, modernization and new capacity as far as cash flows permit. In this section, we examine historical and recent capital spending patterns in order to identify the characteristics which have been typical of these spending patterns.

It is clear that Canada's achievements in forest products exports up to the present day also are a reflection of the pattern of investment which has occurred. By the same token, Canada's future capability in forest products is measurable not only by its likely trade performance, but also by the quality of new investment and re-investment in the sector.

Looking at the period subsequent to the 1982-85 recession, corporate cash flow improved substantially as a result of improved product prices, better margins and higher demand. This enabled companies to improve their balance sheets significantly (Figure 4-5).

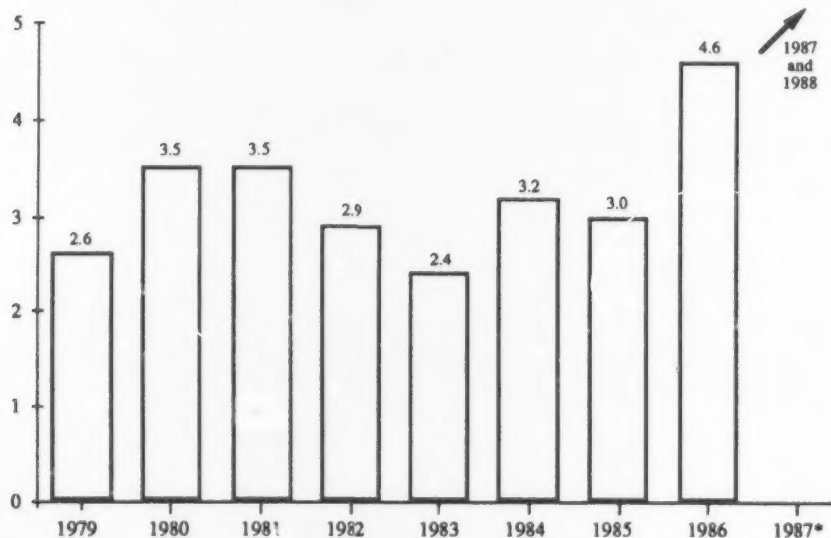
Figure 4-5
Better Balance Sheets
(Debt as % of equity)



Source: Courtesy of Wood Gundy: Financial Flows Report

In the pulp and paper sector, the trend in cash flow has been positive in recent years and strongly upward during 1986-88. It is likely to reach record levels during the current cycle (Figure 4-6). As far as Canada's pulp and paper capability is concerned, there is little doubt that the current spending cycle will result in a considerable increase in new capacity. A great deal of this is in newsprint, comprising both greenfield capacity and upgradings of older capacity. Some product upgrading also is occurring, as older machines are switched to higher value specialty grades and as new machines are introduced in these higher value grades. In addition, new investment has occurred, or is taking place, in the kraft market pulp sector and in other papers and paperboards including integration into comparatively high value uncoated freesheet papers.

Figure 4-6
Canadian Pulp & Paper Companies:
Trend in Cash Flow
 (billion C\$)



Source: CPPA Estimate Based On Survey of Companies

* Data not yet available, but cash flow from operations likely to be at a record level

It is also clear that the current spending boom is resulting in a significant improvement in Canada's productive capability. Nevertheless, some of the major commodity sectors (e.g. newsprint) are experiencing a much larger and better balanced injection of new capital spending than others (e.g. softwood kraft market pulp). Spending in other technologies is much more limited. Nevertheless, some important capacity gains are being achieved in technologies, which are fairly new to Canada, such as bleached CTMP, aspen kraft pulping, LWC, uncoated freesheet papers and reconstituted panel products.

Established companies have built competitive new capacity in higher value grades, but a good part of the new capacity is due to new players. St. Mary's Paper, a new-comer to Canada, was one of the first to develop Canadian capacity in SC papers. Abitibi, however, started late in this grade, but now has built very competitive and good quality paper capacity at its Kenogami mill.

Consolidated Bathurst developed its capability in CTMP at Bathurst, and shipped part of this to its UK Bridgewater mill, but independents such as Tembec, Cascades, Millar Western and Fibreco have been the major players in committing to new market bleached CTMP capacity. In LWC, a relative newcomer, Repap Enterprises, is the pioneering Canadian producer. Use of aspen in kraft pulping spread rapidly during the 1980s at established softwood mills: however, a Japanese company Daishowa, was the first major greenfield commitment to aspen (softwood/aspen mix). The established industry, however, has dominated recent integration into uncoated freesheets (i.e. Great Lakes-Dryden, Domtar-Windsor and Weyerhaeuser-Prince Albert). Whereas, in panel products such as OSB, independents such as Pelican and Waferboard Corporation have been instrumental in developing new capacity.

At the same time, it is relevant to observe that much of the spending is taking place not just because cash flows are buoyant, but because of (a) restructuring of the sector, and (b) so-called special factors.

a) Restructuring:

Restructuring is an on-going process. It is the normal market process through which the relationship between various resources and production facilities is reorganized in order to achieve greater efficiency or to develop a new product-market direction. Frequently, it involves management changes. Sometimes it can involve ownership changes.

In the case of the Canadian forest industry, the pace of restructuring in the 1980-1986 period has been exceptionally strong. In many respects, it has involved more than the normal influences. In particular, there have been an exceptionally large number of ownership changes: subsequently, major new capital injections have been made in many instances.

The new owner often has purchased assets at favourable or sometimes bargain prices; and can better afford to expand capacity. This simply acknowledges the principle of averaging down the cost of an investment. In these cases, the average capital cost per ton of productive capacity typically is lower than the greenfield cost per ton. Moreover, average operating costs per ton also frequently can be reduced if the incremental capital is amortized over the total (now expanded) output.

We also acknowledge that, during the early to mid-1980s, there have been a wide range of reasons for asset sales. Many companies, for example, have streamlined their operations and have pruned assets not suited to their missions and objectives. This has been a healthy process. There also have been defensive sales of assets, frequently related to protecting the core business. This has been particularly prominent in the US and is associated with merger and takeover activity, bids financed by junk-bond manoeuvres, divestment of non-strategic timber holdings as a defence from raiders and so on.

b) Special Factors:

For the purposes of this study these include financial incentives and related concessions made to encourage an investment. Frequently, these incentives represent a significant part of the total investment cost.

An important question arises: How much lower would the real level of re-investment in Canada's forest products industry have been had these ownership changes and special factors not occurred?

For the purposes of our analysis, the recent pattern of capital spending (including projects currently under construction or announced) by Canada's pulp and paper sector, domestically and abroad, can be categorized, very broadly, into a number of types. This is shown in Figure 4-7. We have developed these categories as a rough approximation of the extent to which recent spending can be attributed principally to either:

- Group 1** the normal spending by existing companies based on internally generated cash flows, on upgrading, expansion or integration, characterized by normal market forces meeting commercial banking criteria for return on investment;
- Group 2** special factors where abnormal purchase price considerations apply, or where special financial incentives or packages have been made available;
- Group 3** new investors;
- Group 4** investment by Canadian forest product companies outside Canada;

In addition, in Figure 4-7 we include for the sake of completeness:

- Group 5** withdrawals of foreign companies from Canada.

Clearly, it is difficult to categorize investments quite so neatly. Nor for practical purposes is it appropriate. In reality, the reasons for investment, as discussed later, can be fairly complex.

Nevertheless, we believe that the approach taken below is useful for the purposes of assessing the recent pattern of capital spending in the sector.

Figure 4-7
Capital Investment: Recent Pattern In Canada

- | | |
|---------|--|
| GROUP 1 | Existing companies already operating in Canada for many years, who have re-invested in either (a) new greenfield capacity, or (b) in upgrading, modernizing or optimizing existing facilities, or (c) have vertically integrated where financing has not involved significant or any special situations. |
| GROUP 2 | Existing companies or recent newcomers who have purchased existing assets at a generally considered bargain or favourable price and have subsequently made or are planning significant capital expenditures. Also in this group are companies in Group 1 where special situations apply. |
| GROUP 3 | Recent newcomers to the sector, or companies previously only in joint-ventures, who have invested significantly in new greenfield capacity in their own right. |
| GROUP 4 | Existing companies already operating in Canada for many years, who have invested outside Canada in forest product facilities. |
| GROUP 5 | Forest product companies who have withdrawn totally from Canada. |

Source: WRA

Based on Figure 4-7, we can further categorize spending according to:

Normal Spending

This accounts for the bulk of recent and current capital spending. There are numerous examples covering every region. Major companies such as Abitibi-Price, Boise Cascade, Consolidated Bathurst, C.P. Forest Products, Champion, Domtar, Donohue, Fletcher Challenge (Canada), Great Lakes, MacLaren, MacMillan Bloedel among many others have spent significantly in Group 1 types of investment.

Special Factors

This is a sizeable group. Significant changes in ownership have occurred, and been followed by new capital injections, in a number of cases. In some cases, it is highly likely that further investment would have proceeded under the former ownership, but this is by no means the typical case. The inference is that changes of ownership generally have contributed to a much more positive spending pattern and in many cases have provided a better focus or vision to the acquired operation or company.

Examples of recent ownership changes in Canada include: Fletcher Challenge Canada (Crown and BCFP/Blandin); Weyerhaeuser Canada (Prince Albert); Repap Enterprises (Newcastle-Miramichi and Skeena Cellulose); St. Mary's Paper (Sault Ste. Marie); Cascade (Port Cartier); and Donohue (Matane). In addition, there have been a number of other recent ownership changes, which have been or are likely to be followed by capital spending by the new owners in pursuit of a well defined (internal) strategy. Examples include: Daishowa (Reed-Quebec); Howe Sound Pulp & Paper (Canfor/Oji) and Paperboard Industries (Belkin).

The broad conclusions of this analysis, therefore, are as follows:

- * A large proportion of the capital spending was and is by established pulp and paper companies, representing improvements to existing mills or in new capacity, financed from substantially improved cash flows.
- * Much of this spending is on technologies and a product mix in which these companies already have capacity, either at the same site or within their company.
- * Many of the expansions, or integrations, into higher value added products have involved special factors, such as incentive financing.
- * There is a significant group of relative newcomers, or recent entrants to the Canadian industry and other special factors where significant blocks of assets have changed ownership, through mergers or takeovers (Group 2). Many of these have subsequently upgraded the mills, or are likely to do so, to higher value products.

- * There is a small, but significant group of recent newcomers who have invested substantially in new greenfield capacity, or apparently intend to do so, where special factors apply. It has not always been clear that the financial incentives offered would have been made available to existing companies.
- * A lot of established groups in Canada, have invested, or are doing so, in forest product operations outside Canada (Group 4). In some cases, these are clear and well-thought-out strategies of forward integration. In other cases, investment outside Canada apparently appears to have been preferred to incremental investment within Canada, for varying reasons. Examples include Noranda Forest Products (Tasmania); Abitibi (US and Venezuela) and Cascades (France). Each of these appear to have very sound logic behind them (e.g. Noranda's access to eucalyptus pulps, Abitibi's securing market position etc.). Nevertheless, from an overall perspective it is likely that, in these cases, investment overseas has more benefits or appeal than further investment in Canada.
- * Finally, in sharp comparison to the earlier period, 1975-85, there have been very few companies who have withdrawn totally from Canada in recent years (Group 5).
- * Nevertheless, it is clear that investment interest in Canada by US forest products companies (excluding US parents of existing Canadian companies) has been very limited in recent years. The same is true of European companies.

The general conclusions of this brief analysis are that healthy levels of capital spending are taking place in Canada, in upgradings, new capacity and higher value added products. Nevertheless, these spending levels could not have been achieved simply on the basis of cash flows from the current cycle. Moreover, the mix of capital investments taking place still favours Canada's traditional product profile. Importantly, there has been very limited direct investment by new US or European companies beyond those (e.g. Champion, Hinton expansion) who are established already in Canada. Japan, in contrast, has been very active recently in Canada.

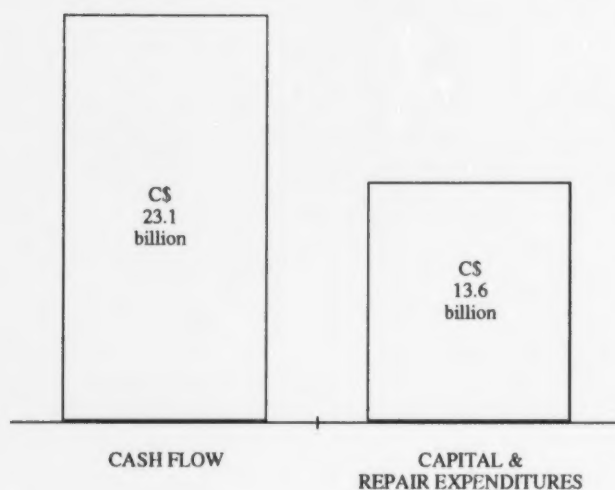
It is suggested that one of the reasons for this could be that Canada's investment climate in the forest sector is not as attractive as the current buoyant spending cycle would suggest. In the section below, we indicate that the affordability of desired investment in the sector, and the risks associated with increased investment, may be the crucial policy issues for the sector in the coming years in Canada.

Spending in Relation to Cash Flows

It has often been said that the sector spends what it has available. This is summarized in Figure 4-8, which shows that of the Canadian forest industry's total cash flow of C\$23.1 billion over the 1980-86 period, nearly 60% or C\$13.6 billion, was spent improving or expanding existing mills and equipment or putting in new capacity. The reader should refer to the latter portion of this section for discussion of other cash flow items.

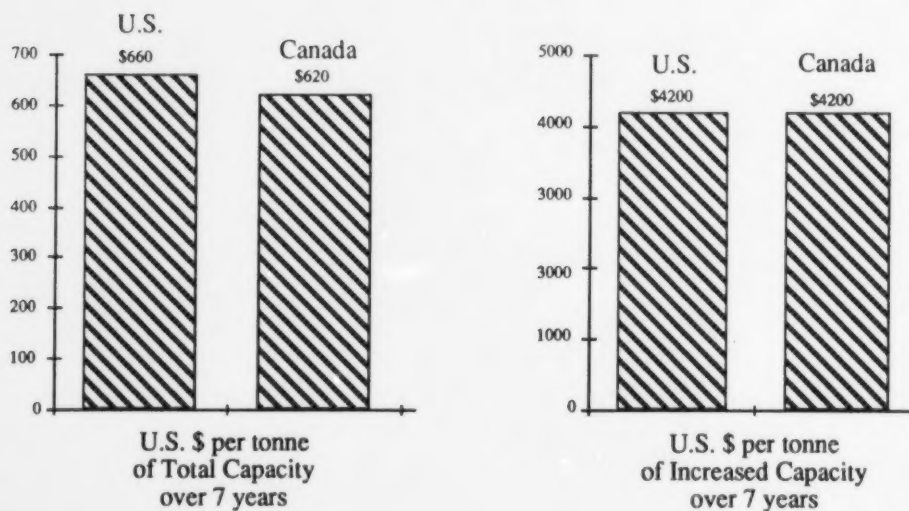
Firstly, we look at the global picture. The amount of spending by the Canadian forest products industries appears to be at least comparable in relation to its size, with many of its competitors. One estimate of US pulp and paper capital expenditure shows that, over the period 1980-86, the US pulp and paper sector spent nearly US\$49 billion on upgradings and new capacity. Its average capacity in paper, paperboard and market pulp during this period was close to 74 million tonnes, and the incremental capacity put in place over the period was around 11.5 million tonnes. This spending level was equivalent to an average of US\$660 per tonne of total capacity or US\$4200 per tonne of incremental capacity (Figure 4-9).

Figure 4-8
Canada's Forest Industry, 1980-1986



Source: Statistics Canada

Figure 4-9
Spending by Pulp & Paper Sector on
Upgradings & New Capacity
(7 Year Total - 1980-1986)



Source: WRA

In Canada, over the same period, the pulp and paper sector's spending level worked out to be almost exactly the same as that of the US pulp and paper sector. This estimate is based on reasonably comparable data. Upgradings and new capacity in the paper and allied industries involved total spending of US\$14.5 billion over the period, based on average capacity of 23.5 million tonnes and incremental capacity of 3.5 million tonnes. Although very approximate, these data suggest that capital spending per tonne of capacity by the Canadian pulp and paper sector on upgradings and new capacity equalled that of the US over the 1980-86 period.

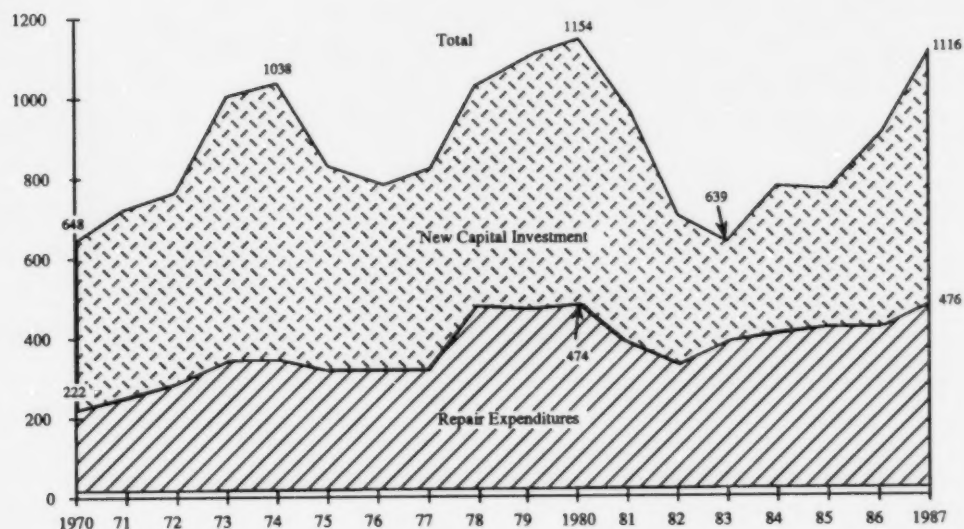
Obviously, there are significant differences in capacity profiles between the two countries. Moreover, Canada is proportionally more involved in capital intensive pulp mills than is the US, per tonne of capacity. Nevertheless, this rough comparison would tend to support the view that capital and repair spending by Canada's pulp and paper industry is fairly well balanced in relation to its overall manufacturing capacity.

In comparison with recent heavy spending levels in many countries, such as Sweden and Finland, however, Canada's spending, in relative terms, may be considered somewhat modest. Nevertheless, most well-informed observers of the industry know that both of these countries have made major efforts to restructure their forest sectors, as a matter of national policy. The emphasis (driven by rising cost structures similar to those which Canada is beginning to experience) has been on achieving a higher value added product-mix. Huge capital investments have been made and, so far, the rates of returns on these investments have been fairly modest. The expectation is that the longer run economic rate of return, and certainly the social rate of return, will justify these significant upgradings.

State involvement is apparent as a pump primer in both cases. In the past two to three years, however, increased levels of corporate concentration have been permitted in Nordic countries and market forces have been encouraged as the primary means of achieving the desired structural changes.

While global comparisons in wood products are more difficult to make than in pulp and paper, Canada's wood products sector also has experienced a surge of new spending in the current cycle (Figure 4-10). In real terms, this has almost doubled since the very low cyclical point of 1982.

Figure 4-10
Canada: Wood Products Sector
Capital & Repair Expenditures
 (Real Terms)
 (1988, \$ million)



Source: Statistics Canada

Clearly, over the longer term, total spending closely follows the sharp market cycles which characterize the sector. Interestingly, in real terms, the cyclical high points are approximately the same. Yet, over the three cycles shown in the figure, Canada's wood products output has expanded very significantly. In softwood lumber, from 1970 to 1987, Canada's exports to the US market rose by over 8 billion board feet, and lumber production doubled.

Capacity growth has been apparent in all areas except on the BC Coast. This growth has been achieved partly by significant injections of new capital and partly by improved sawmilling practices. Moreover, on the BC Coast many of the older mills designed for large logs have been completely rebuilt. They include: Chemainus, Alberni Pulp Division, Fraser Mills, BCFP Hammond & Marpole, Eburne, and Bay Forest Products. In most other areas, the great majority of new capital investment has been in modernization and upgrading rather than in greenfield plant. Individual mills have expanded capacity significantly in order to capture the economics of scale and to justify investment in a variety of optimising technologies. Thus the total investment shown is the sum of a few major greenfield mills plus many relatively small investments in the \$5-10 million range annually, over a period of years.

It is only recently that there has been a significant number of major investments such as the new Linck mills in BC (Interfor and Westar), Canfor in Grande Prairie and Fraser in New Brunswick. It is also important to note that a significant share (20-30%) of the recent surge in new capital investment is accounted for by an expansion of the panel product industry. New waferboard/OSB and particleboard/MDF mills have been built, partly in response to demand from the US and partly to satisfy a growing domestic market.

In the US, West Coast lumber mills have experienced much better relative earnings in the current cycle. Moreover, since the countervailing action, the overall competitiveness of US wood products firms has been improved significantly. Capital spending is beginning to accelerate.

4.2.3 Financial Constraints

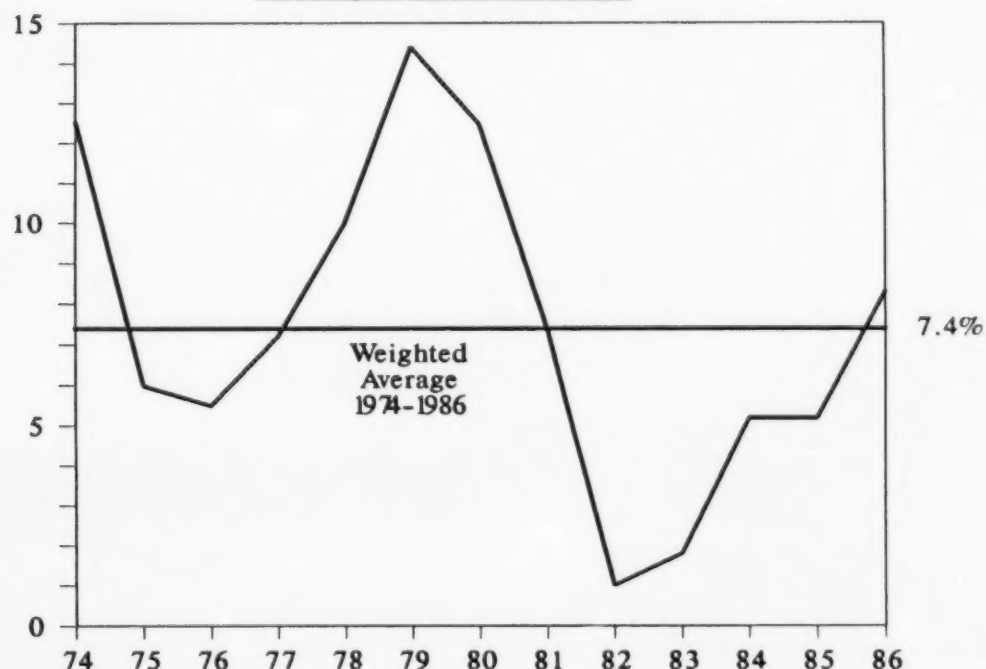
Looking at the national picture, the forest industry appears to provide a fairly modest rate of return on equity investment compared with some other sectors. Nevertheless, it appears to be quite successful in attracting a variety of new investment funds, as demonstrated by the very extensive growth which has occurred, and is still occurring, in new capacity. Earlier, we concluded that recent changes in ownership have facilitated the injection of new capital in some manufacturing operations. By far the largest source of funds to the sector, however, is its cash flow from operations. New equity issues and debt also are important. Also, we noted that other special factors have brought about the same result.

The reasons for investment by companies in new capacity or upgrading and modernization of existing facilities can be attributed to a number of factors. Fundamentally, the decision ultimately involves a balancing of the risks and rewards. One of the major risks of the sector is its cyclicity. Against this, the rewards, which appeal to many companies, include the healthy long term growth trend of the sector and its strong base in natural resources. Moreover, the manufacturing leverage that can be obtained, in terms of value added products, frequently can be substantial. Moreover, there are significant differences between pre-tax and after-tax rates of return from the sector. Accumulated tax losses, investment tax credits and so on each have an impact.

Clearly, these are only a few of the factors. They are sufficient to indicate, however, that the explanation for ongoing investment in the forest industries probably lies beyond superficial measurement of average rates of return.

During the 1970s, some major reports were published in Canada pointing to the very poor average rates of return on investment from the sector. These reports frequently also dealt with the issue of capital grants versus tax based incentives, which were a policy issue at that time. Recent survey data support the observation of these reports that major portions of the forest industry yield very modest average rate of return on investment. CPPA survey data, for example, indicate that the weighted average (1974-1986) return on net assets employed for selected major pulp and paper companies was around 7.4% (Figure 4-11). Analysis of smaller companies and their average rates of return, however, suggests that sometimes very favourable, but again very cyclical, investment returns frequently have been achieved. The cyclicity of the industry is dramatically illustrated in Figure 4-11. This is clearly a major modifying influence to be taken into account when evaluating the pulp and paper industry's investment performance.

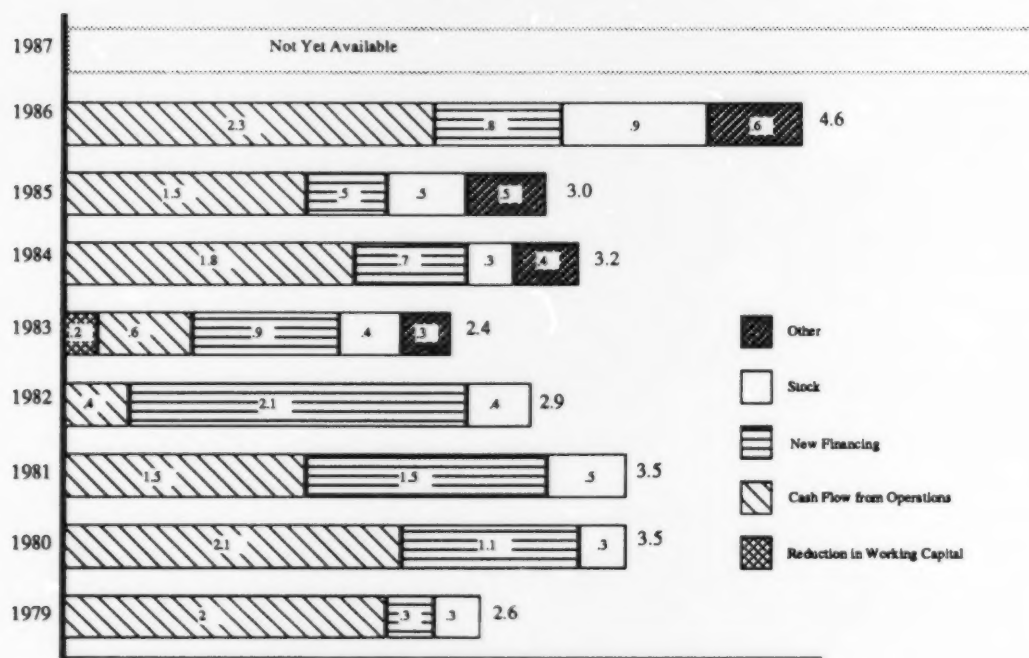
Figure 4-11
Percentage Return on Net Assets



Source: CPPA survey of pulp and paper companies representing about 80% of Canadian shipments of pulp and paper.

One of the main constraints to the sector's development is the very extensive level of new capital expenditure required in relation to free cash flow. Free cash flow, in this context, refers to earnings attributable either to shareholders or available for re-investment in upgradings, modernization and expansion. These data are not readily available on a comparable basis for the industry overall. Figure 4-12, however, summarizes total sources of funds for a large sample of Canadian pulp and paper companies.¹ Overall cash flow from operations is a component of this and serves as a useful illustration of the variability of internally generated funds over much of the past ten years.

Figure 4-12
Canadian Pulp & Paper Companies: Cash Flow
Source of Funds
(C\$ Billion)

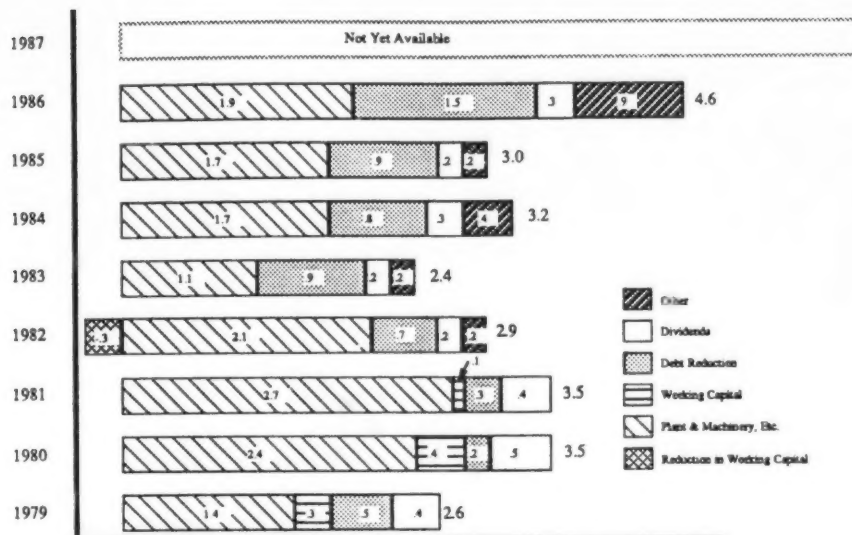


Source: CPPA Annual Survey of Companies

Figure 4-13 shows the application of funds for the same sample of companies. Clearly, capital expenditures are a major drain on cash flow.

¹ CPPA survey data: note that the sample size varied from year to year.

Figure 4-13
Canadian Pulp & Paper Companies: Cash Flow
Application of Funds
 (C\$ Billion)

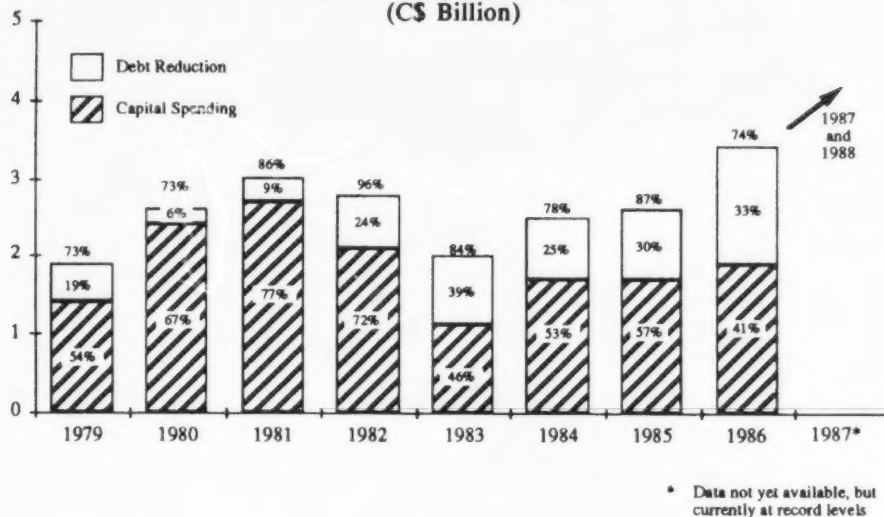


Source: CPPA Annual Survey of Companies

In total, the amount of funds required for debt reduction and capital spending account for the bulk of cash flow. Over the eight years, 1979-1986, this varied from 73% to 96% of cash flow as shown in Figure 4-14. The absolute dollar amounts also are shown. As a result, dividends, as a percentage of cash flow, have been very modest (Figure 4-15). Moreover, the ratio of dividends to capital expenditures (Figure 4-16) supports that, beyond the minimum commitments dictated by normal dividend policies¹, the priority of most forest products companies is to re-invest all available cash in upgrading, modernization or new capacity. The overall result, from the shareholders perspective, is summarized in Figure 4-17.

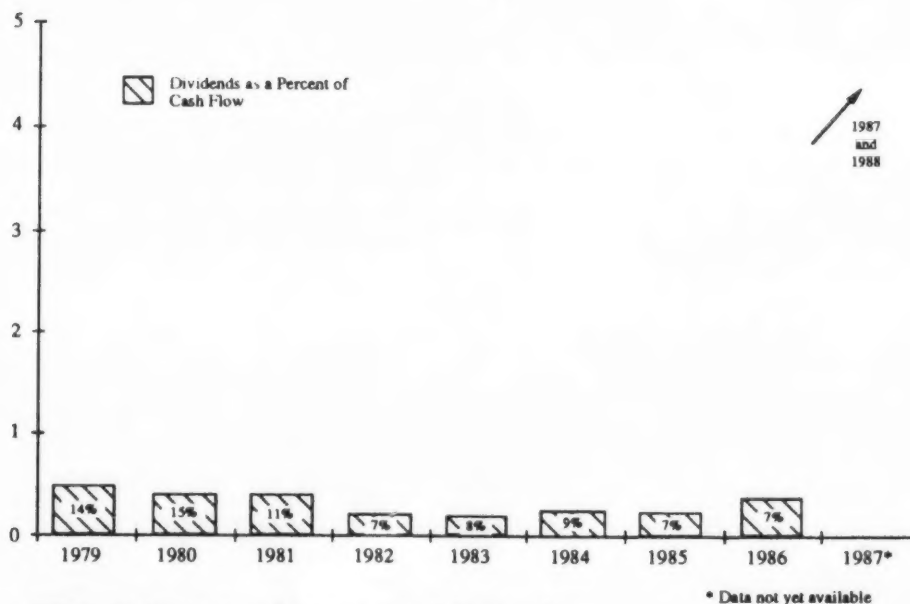
¹ Analysts differentiate between yield stocks and those which pay out low or zero dividends but offer high capital gains. Companies, moreover, try to keep dividends rates consistent or rising.

Figure 4-14
Canadian Pulp & Paper Companies:
Trend in Capital Spending
 (C\$ Billion)



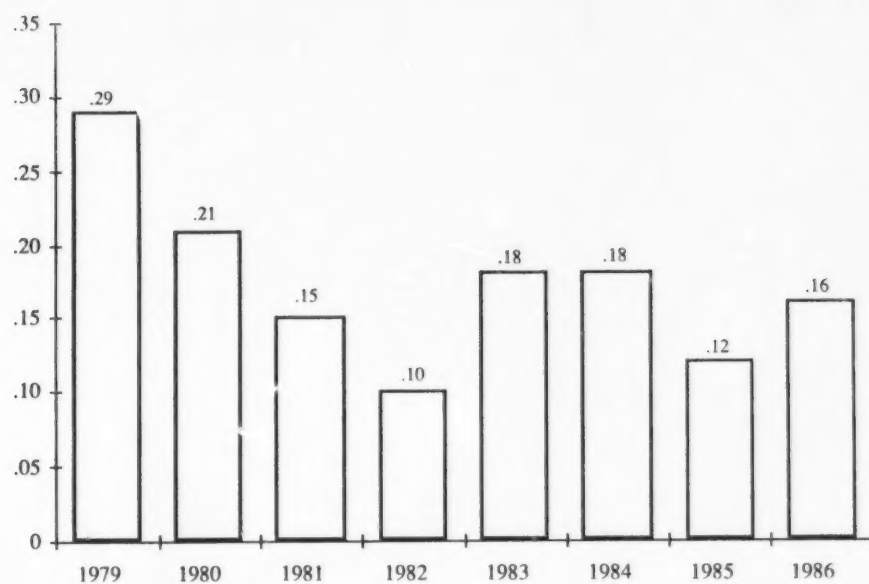
Source: CPPA Estimated based on Survey of Companies

Figure 4-15
Canada's Pulp & Paper Sector
The Need to Stay Cost Competitive Drains
Companies' Cash Flow: Dividends Take a Back Seat
 (C\$ Billion)



Source: CPPA Estimate based on Survey of Companies

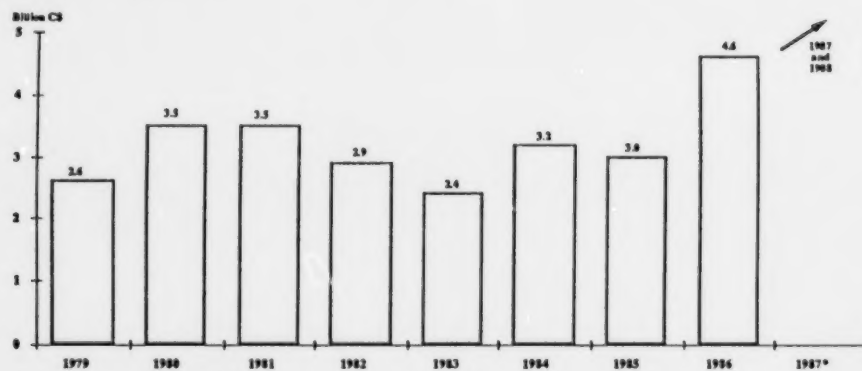
Figure 4-16
Canada's Pulp & Paper Sector
Ratio: Dividends to Capital Expenditures



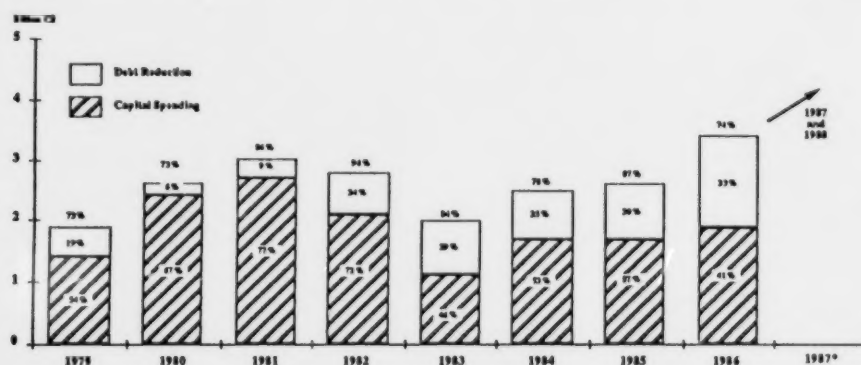
Note: Based on rounded data

Figure 4-17
Canada's Pulp & Paper Sector

The Industry is Very Cyclical.....



.....When Cash Flows Improve, Most of it is
Spent to Improve Mills & Equipment.... or to Reduce Debt



....And Dividends Have to Take a Back-Seat

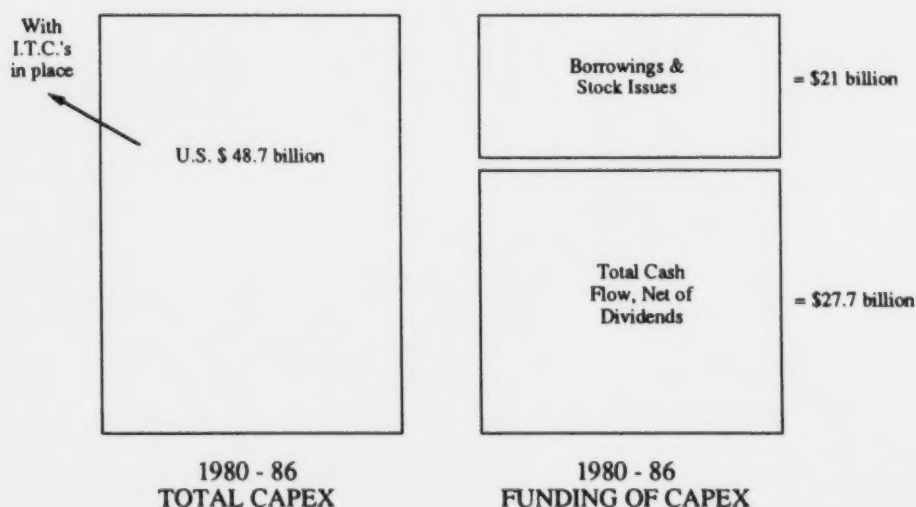


The high level of capital spending required to keep pace with, or move ahead of, the average has implications, too, for companies' capital structure.

In the late 1970s/early 1980s, many Canadian forest products companies borrowed heavily to finance capital spending and acquisitions. This appeared to be prudent at the time because (a) real interest rates were low and (b) because of the widely held belief that high rates of commodity-product price inflation were likely to continue well into the future, thus justifying the high level of debt-equity leverage incurred by many companies. Subsequent experience proved to be quite the opposite.

This was true not only of the forest industry but many other sectors in Canada as well. Also, it was true of the forest sector in the US and elsewhere. In the US, capital spending requirements of the pulp and paper industry (Figure 4-18) led companies to new stock issues and borrowings. The structural changes which subsequently occurred in the US industry, including a high degree of merger and takeover activity and industry rationalization, are well known to those in the industry.

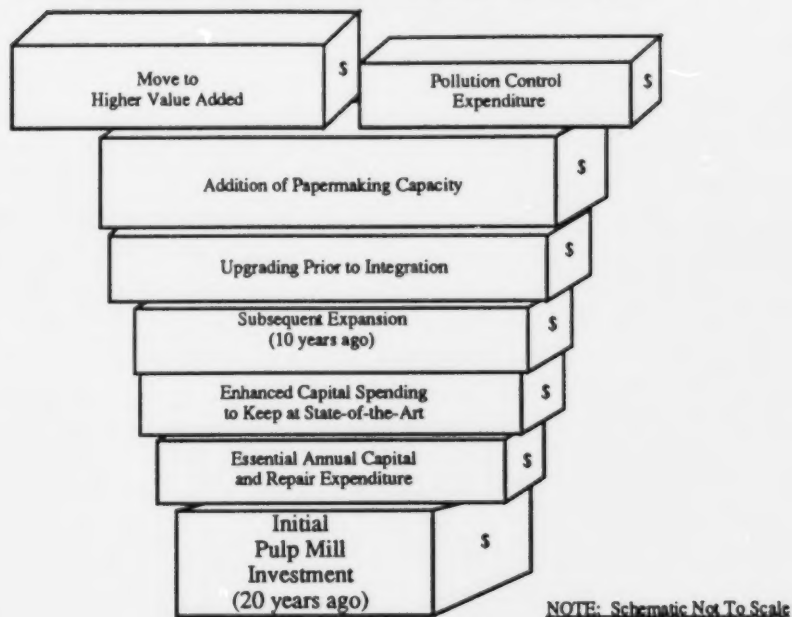
Figure 4-18
US Pulp & Paper Industry
Capital Investment (Capex)



Source: Simpson Paper Company

In Canada, the movement towards higher value-added increases the potential risks of investment. For the equity investors, the prospects can be summarized as shown schematically in Figure 4-19. In this hypothetical example, Canada's kraft pulp and paper sector is used as an illustration of the ongoing injections of capital that are required.

Figure 4-19
The Capital Pyramid
Value-Added Potential:
Significant New Capital Injections Are Required

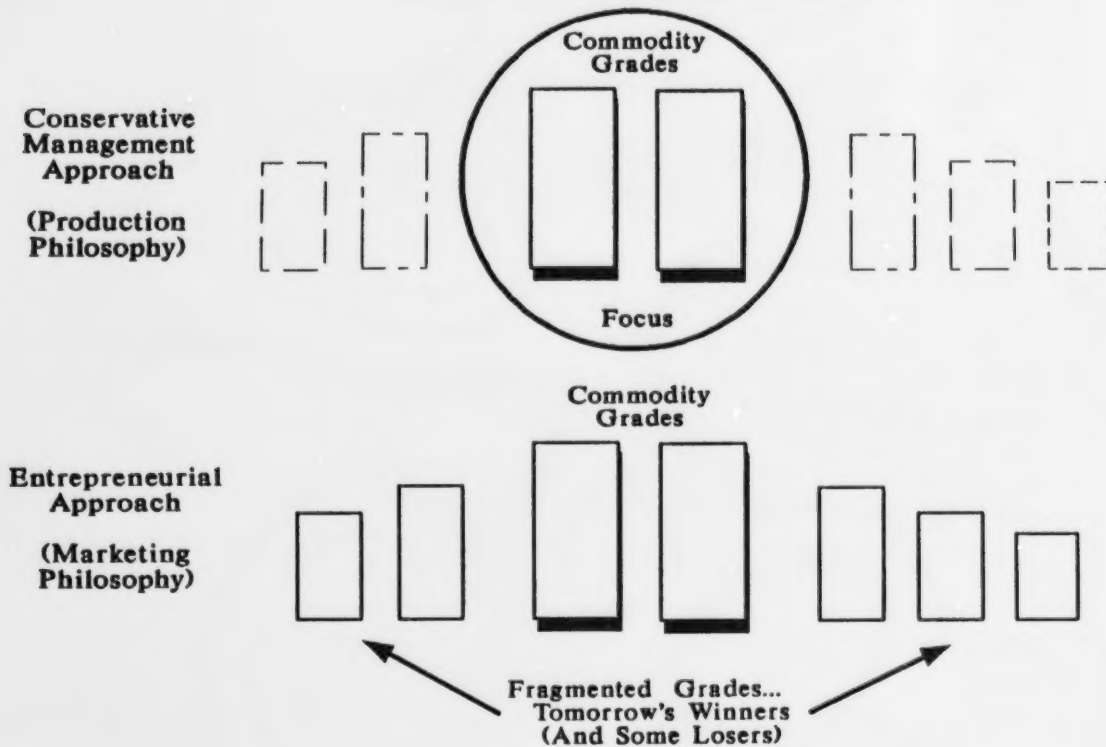


Source: WRA

On its own, each increment of capital investment may appear moderate, and frequently can be leveraged, but it is the cumulative effect of sequential capital outlay that is most important to the longer-term viability of the total investment. Given that the only sure thing is change, remaining competitive in the original product (e.g. BKP) requires continuing re-investment to keep up with the state-of-the art. When pulp markets mature and new, lower cost competitors enter the stage, it may appear opportune to integrate forward into a higher value-added product such as paper. Faced with such prospects, management can take either a defensive cost minimizing or a more aggressive value-added approach to capital spending. When a defensive path is embarked upon, investments tend to be of the same type and this can lead to a dilution in the overall rate of return. An aggressive, well-timed move to integrated papermaking, on the other hand, is likely to be a more profitable, though riskier, alternative.

As noted earlier, one of the disadvantages of Canada's traditional role as primarily a commodity grade producer is that it results in a bias towards production philosophy and a conservative approach to investment (Figure 4-20).

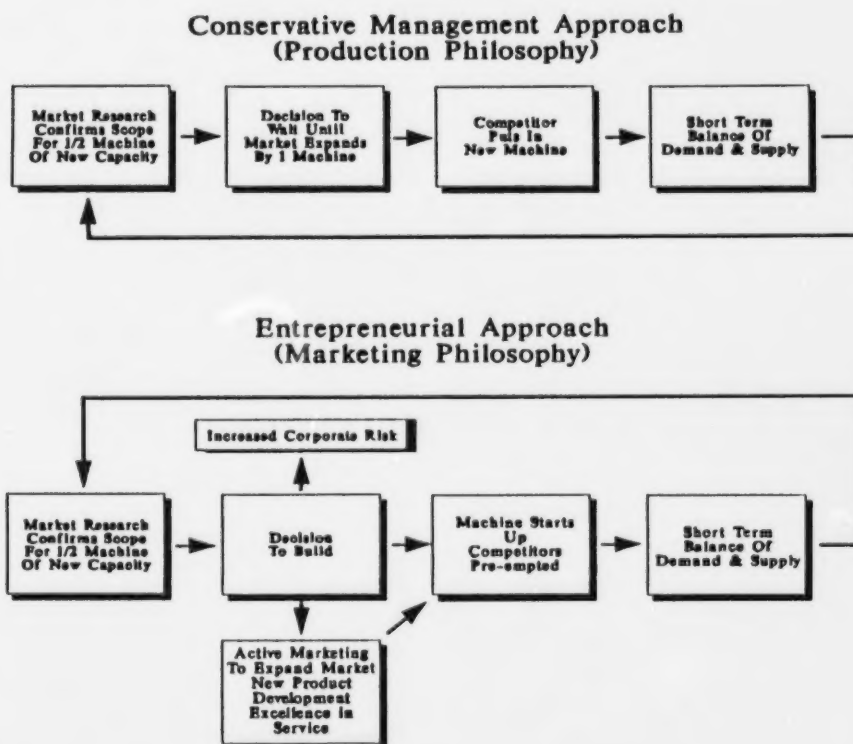
Figure 4-20
Constraints: Commodity Grade Pre-occupation



Source: WRA

In part, this is inevitable given the economics of commodity grade production. Like many other industries, any significant increase in incremental manufacturing capacity in forest products usually has to be made in large chunks. This invariably requires very large capital commitments. Much of the commodity-based industry in Canada traditionally has been constrained, in the quality of its investments, by full machine thinking (Figure 4-21). For example, if a company's market research confirms that sufficient incremental demand exist for the equivalent of half a machine of new capacity, the choice is (a) either to wait until the market expands sufficient to justify a full machine, or (b) commit immediately to the incremental capacity of a full machine and, through active marketing and focus on product quality and service, develop the available market share closer to total supply increment.

Figure 4-21
Constraints: Full-Machine Thinking



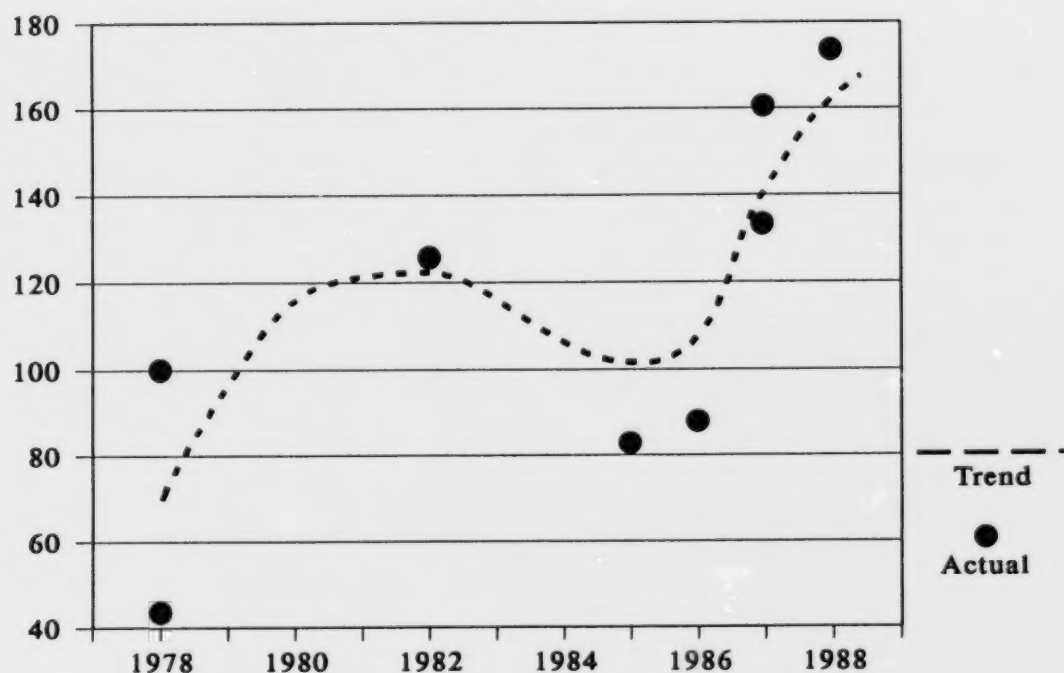
Frequently, this may also involve a compromise, over the short term, with regard to operating rates and product pricing which may not be acceptable to a company, or its bankers or existing customers who will require parallel price discounts. While it sounds easy, in practice it is harder for commodity scale producers to decide in favour of the more entrepreneurial approach.

An example of the more entrepreneurial approach has been the recent expansion of waferboard/OSB capacity in Alberta and BC. In order to achieve economies of scale the companies installed capacity that was well above current market demand and accepted low returns in order to force product into the market.

Also, as noted below, these circumstances produce a bias away from technological leadership and consequently low priority is given to R&D expenditures.

The corollary of full machine thinking on new investments is the tendency of major producers of any specific grade to announce capacity expansions almost simultaneously. In Canada, this has happened with newsprint over a number of cycles. New investment usually becomes a consideration when cash flows are favourable. Companies also will commit to new capacity to retain market share. Over-capacity in commodity grades is frequent, and this is a global phenomenon. Whereas machine and capital equipment prices tend to be very competitive during periods of low capital spending, the percentage increase between low and high points of the cycle frequently can be very dramatic. Figure 4-22 illustrates this for newsprint machines purchased in Canada over the past ten years.

Figure 4-22
Newsprint Machine Prices in Real Terms
(1978 = 100)



Source: H.A. Simons

Actual machine prices are shown on an indexed basis (1978=100) and the overall trend also is plotted. Most of these machines are broadly comparable for the purposes of illustrating this point but, of course, trim width, speed and other features have undergone significant improvements over the period. Nevertheless, during the current cycle, newsprint machines have doubled in price over the past two years, from an admittedly unrealistically low level in the low point in the cycle. The point, however, is that this is not uncommon and continues to happen. There are a few, but notable, exceptions of companies in Canada which purchase and invest counter-cyclically.

4.2.4 Investment Policy Options

A substantial increase in capital spending, above historical levels, will be necessary if Canada is to achieve its growth potential. Moreover, the type of investment required will have to place greater emphasis on higher value products in Canada's overall mix of forest product exports. Like all other countries, Canada has a wide range of policy options and tools at its disposal to achieve desired investment levels. In the past, Canada's policies frequently have involved direct measures such as regional development grants. Increasingly, the forest sector itself has indicated its preference for generally applicable, indirect measures to facilitate investments.

There are advantages and disadvantages to both. Direct regional grants favoured site specific situations and had the potential to lead to more precise targetting of investment both in terms of (a) desired location and (b) desired process or product technology. On the other hand, they were criticized for being selective and unfair on the majority of companies who rely on market forces to achieve investment. Indirect, perhaps tax-based measures, appear to be more favoured by the sector itself. They are available to all and the ground rules are clear to everyone. Nevertheless, they have not so far lent themselves to targetting.

This is particularly desirable, and can be determined in conjunction with the industry itself, as Canada continues to upgrade its product-mix. Further discussion appears to be warranted on the desirable features of investment policy as it applies to the sector, if Canada's potential in this regard is to be achieved.

4.3 TECHNOLOGY ISSUES

4.3.1 Producing More From Less

The fundamental economic imperative of the present day, relating to the rapid changes which are occurring in technology, is quite simple. There is a strong drive to produce more and better quality, products using raw material and other resources much more productively than has been the case traditionally. This has been expressed simplistically as the need to produce more, from less.

By force of its circumstances, Canada's forest sector has been accustomed traditionally to extensive utilization of its vast areas of indigenous raw material resources. It has served export markets with basic and intermediate goods, such as construction lumber and market pulp, as well as some relatively low value added paper grades, such as newsprint. The reasons for this were noted earlier (see Section 1.0). Increasingly, this role has been changing and the pace of change is likely to accelerate over the coming years. Some of the economic and financial implications of these changes, over the next twenty years or so, were discussed in the previous section. In this section, the intention is to provide a perspective for further discussion of technology related issues facing the sector.

The overall thesis presented here is that the forest sector in general, and the Canadian forest products manufacturing sector in particular, are experiencing very high levels of technological change. Moreover, it is argued that these are very healthy developments for the survival, competitiveness and future growth of the sector globally. Canada has excellent prospects to become much more pro-active in contributing to, and benefitting from, these technological changes.

4.3.2 Major Technological Thrusts

Throughout this study, the analytical focus has been on market driven opportunities for Canada's forest industries. In keeping with this, it is relevant to note that many of the technological changes which are evident so clearly in the sector today, stem ultimately from changes in the marketplace. This is true even of technological improvements in the woods and of process and productivity improvements in the mills. The driving force and justification for these, predominantly, is market economics.

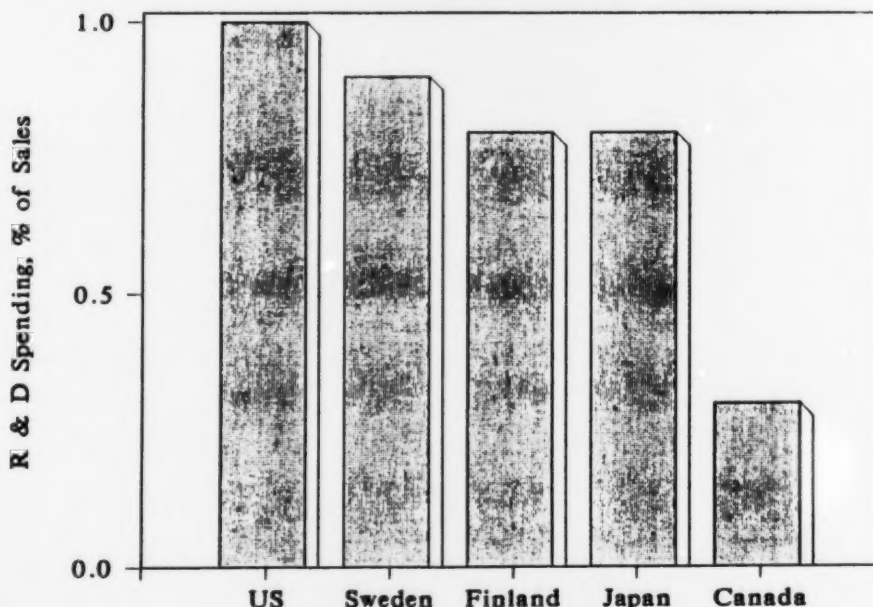
In Section 2.0, we identified a number of favourable opportunities for future growth in Canada's forest industry. One example of this is the possible conversion of potentially uncompetitive newsprint mills to mechanical fibre-based printing/writing papers also plays an important role in the future scenario for Canada. The analysis of the newsprint sector (Volume III) points out the economic pressures to replace a large part of Canada's newsprint capacity with new mills and/or machines. In addition, part of Canada's potentially uncompetitive softwood kraft pulping capacity could be channelled into higher value added grades in a similar way.

One of the potential constraints to achieving these opportunities is the sector's poor historical performance in new product and process development and its low level of expenditure on R&D. The thesis that we present in this study is that the manufacturing industry needs to take a much more aggressive role in technological leadership internationally in those products and processes in which Canada has unique strengths and the ability to achieve a very strong competitive position.

With regard to the newsprint example, we noted in Section 3.0 that some of the smaller newsprint machines which exist in Eastern Canada could be converted into the fragmented area of uncoated, nearly coated and coated mechanical grades. The dynamic nature of this range of products lends itself to smaller machines catering to specific market niches. As the life cycle for many of the evolving products matures, they too will require large high output machines to remain cost competitive. Meanwhile, the rate of emergence of new product variations promises to provide fertile ground for companies that wish to pursue innovative marketing strategies.

The key to achieving this scenario, of course, is the ability and willingness of the Canadian industry to undertake this structural shift. The challenging and innovative nature of the product development process is in sharp contrast to the relatively more static product profile, and process technology orientation, associated with the bulk of Canada's output in market pulp and newsprint. The development of new products is directly related to R&D spending or, as a short term expedient only, access to superior technologies through technical licensing agreements. In this regard Canada has, in the past, seriously lagged behind other developed producing nations (Figure 4-23).

Figure 4-23
Pulp & Paper Research and Development
Expenditures by Country



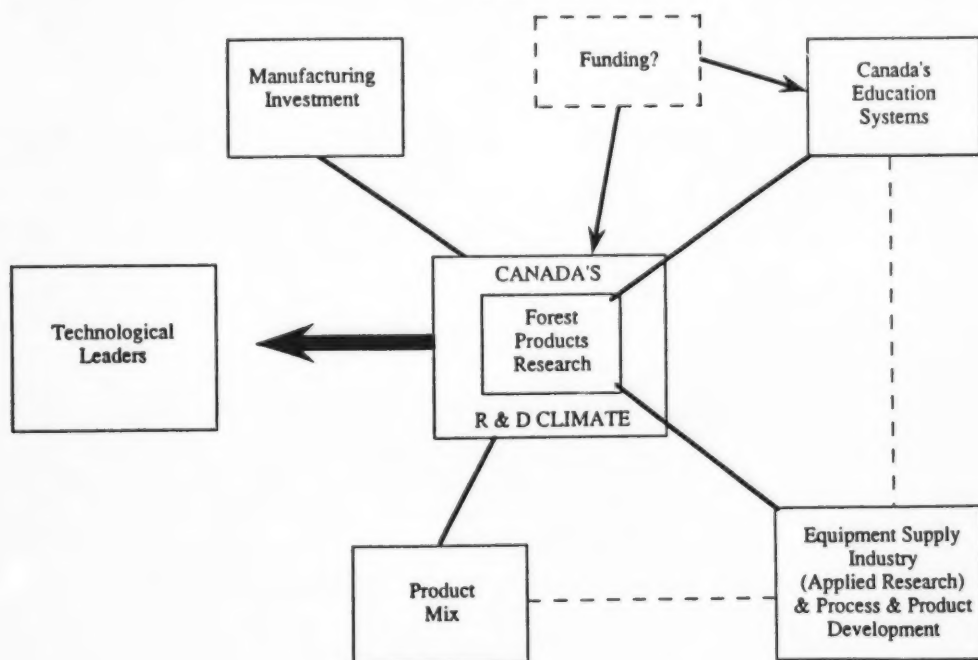
Source: Pulp and Paper Canada 87:10 (1986)

The commodity orientation of the product profile in Canada has allowed the industry to survive and prosper with the low level of R&D investment in the past. The more sophisticated printing/writing products have always required a more intensive R&D effort, and now with the increased pace of technological development, an even greater effort is needed. Apart from the obvious question of whether Canada has the appropriate facilities and structure to put in the necessary effort, a very real question is whether Canada's companies are willing to catch up technologically while simultaneously undertaking the very high level of additional capital expenditures required.

One of the drawbacks that Canada faces possibly is the lack of any significant multiplier effect within its economy to support the adoption by manufacturing companies of new technologies. As already noted, there is a high degree of risk involved, particularly in pioneering research and development into new products. The payback on process research expenditures is more evident for most Canadian companies.

One way of looking at the multiplier effect is presented in Figure 4-24. If each of the elements shown are coordinated through cooperation and communication, and are focussed on generally agreed goals, the overall result is a much more effective sector. Moreover, each sub-sector relies more on the others for its inputs, or to use its outputs, so that efforts are not duplicated, wasted, ineffective or simply out of phase with the others. In essence, the evidence is that Canada's forest sector is not achieving the full value of all the potential synergies which exist between the various narrow sub-sectors of the sector. Nor is it exploiting those which exist between the forest sector and the economy as a whole (e.g. with Canada's education system). Clearly, there is some level of relationship between the sub-sectors, but this is not exploited to anything like its full potential. With the goal of achieving technological leadership, better coordination and cooperation between the various components would appear to have significant benefits.

Figure 4-24



In the first instance, forest sector research is related to the overall tax and financial climate for R&D spending in Canada as a whole. The forest sector, although one of Canada's most important growth industries into the 21st Century, does not receive special treatment of any kind. Secondly, as already noted, Canada's indigenous applied research facilities, represented in part by the equipment supply sector, have given way to foreign ownership. This is not necessarily bad in itself, provided that R&D capability is retained. Sadly, many of Canada's equipment supply companies, with a few notable exceptions, have become relegated to the status of branch-plant or sales-offices.

Canada has excellent, but modest, facilities through the Pulp and Paper Research Institute (PPRIC), Forintek and other research institutions, including some company R&D facilities (e.g. Domtar, MacMillan Bloedel and others). Also, the Canadian forest sector is well represented internationally in applied research efforts through institutions and other vehicles such as the Canadian Pulp and Paper Association (CPPA) technical committees. Nevertheless, considerable scope remains for achieving a higher degree of multiplier effect, similar to the impressive achievements of the Swedish industry.

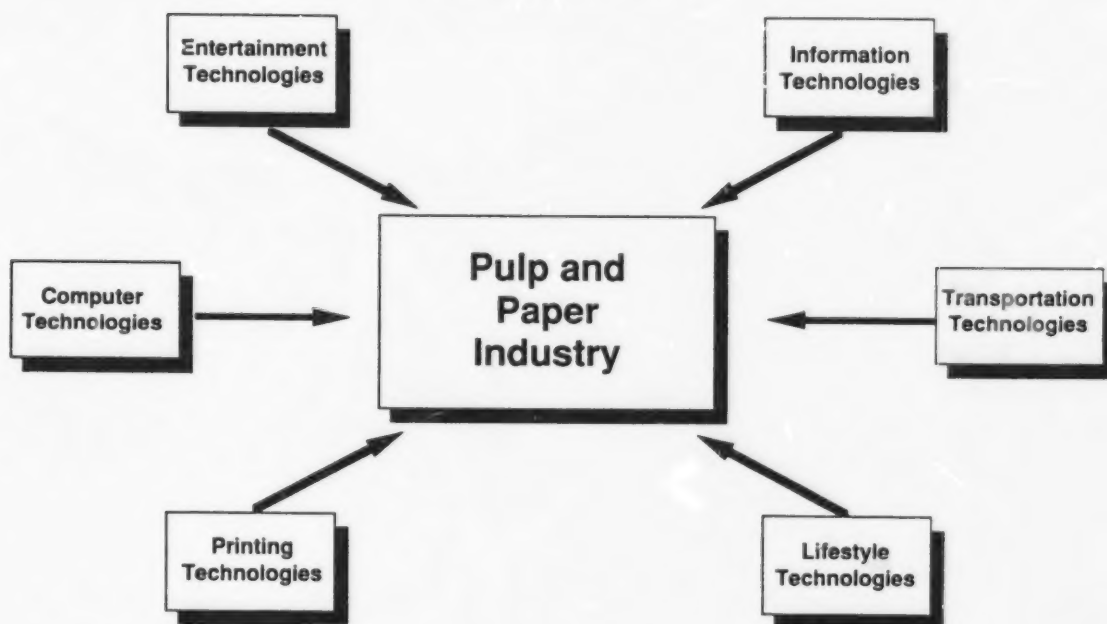
Despite the temptation to cite Nordic experience, it is relevant to note that Canada's major competition in applied forest products research and development in the future most probably will be the US. In the US, the support sectors to the industry are becoming very well developed. Major US companies provide significant funding to forest products R&D related schools, such as the University of Maine, University of South Carolina, Western Michigan University and so on. Canadian universities receive some support from equipment suppliers, but the magnitude of this support is far greater in the US.

Moreover, in the US the focus is more heavily than in Canada on advanced technologies, such as automation, sophisticated research into process analysis and cooperatively funded efforts in new product research (combining, for example, ink makers, printers and paper makers with converters and end-users). The US, as noted, is a major growth market. Correspondingly, it receives a great deal of attention from suppliers, in the invest sense of the word (e.g. the education system as a supplier of well trained graduates in sophisticated technologies).

The Need to Focus on Product Technology

In addition to today's predominant emphasis on process technology, Canada's forest products industry has considerable scope for development of product R&D. Moreover, it could benefit substantially from this approach. In the past two decades alone, incredible technological changes have taken place in product and process technologies (Figure 4-25).

Figure 4-25
Incredible Technological Changes
Have Taken Place!



Many of these have been thrust upon the forest products industry as a result of equally high rates of change in those sectors. Transportation technologies, for example, have changed. Containerized shipments of goods have brought about the need for new and better ways of packaging (e.g. low bulk, strong light packaging), and have eliminated or reduced the need for some other forest products. Pulp and paper grades compete with each other, and with other materials such as glass, plastic and metals.

There have been tremendous changes in information technologies as a result of advances in micro and macro electronics, the office revolution, lifestyle technologies and communications. Printing and related technologies have advanced to a very sophisticated level demanding new, higher and different quality materials and releasing the potential versatility of others (such as short fibred pulps). In wood products, successive generations of panel products have replaced traditional sawnwood products in construction, industrial and consumer goods markets. Examples include various particleboards, MDF, wafer and strand-boards as well as laminated and decorative plies. Successive generations of higher quality lumber products have been possible, often from a declining quality base of raw material, through technologies such as finger-jointing and edge gluing. New engineered products include stress-graded lumber (MSR) and laminated veneer lumber (LVL).

Overall, the success of the forest products industry globally has been due to its ability to be innovative in developing an increasing array of new products and finding better and less expensive ways of providing these to the customer (Figure 4-26). These two longer term trends are well established in the industry. Commodities and semi-commodity products of increasingly high quality (in the sense of real or perceived value to the consumers) are often made at declining real prices.

The development of higher performance products, frequently at a higher price to cost ratio initially than commodity and semi-commodity grades, provides scope for enhanced profit margins. Eventually, however, as demand and supply expand there is, once again, downward pressure on real prices and margins.

Figure 4-26



**Better Products
at Lower Cost**

This is a fundamental reason for having confidence in forest products markets globally. These trends in forest products production fit well with the basic driving forces of free market economies. The challenge for Canada lies in its response to the technological challenge, comprising process and product-markets.

Discussion of technological leadership and R&D policies would be incomplete without considering Canada's equipment supply industry. The sad truth is that Canada's capability and autonomy, in this regard, have declined seriously over a long period of years. With a few exceptions, much of Canada's equipment supply sector has lost much of its virility. It has become increasingly foreign owned, but has not derived, to any significant degree, the benefits of being able to draw upon technological advances offered by this linkage with international equipment suppliers. Instead, many Canadian facilities, in effect, are branch plants rather than being centres where new product innovation, design and development occur.

As a result, much of the potential for linkages between this support sector and the forest products manufacturing sector are not fully exploited. Canada's high educational standards and excellent basic training are not tied into sector development to anything like their full potential. The initiative and industry funding, for product and process R&D gradually is filtered away to Nordic countries, the US and elsewhere.

Advances in technology in combination with changing market forces demand that attention be given to new product development as well as a renewed effort in process innovation. This is in contrast to the sectors poor historical record in these areas and the attendant overall low level of R & D expenditure. A much more aggressive role in technological leadership will be a fundamental ingredient for future growth and sector competitiveness.

It is inappropriate for Canada's forest sector to consider a blanket approach to its R&D policies. Instead, as discussed earlier, the focus (guided by the industry itself) should be to concentrate on those technologies where Canada has a unique role or potentially strong competitive position. These are discussed extensively in Volumes III and IV of this study, and have been referred to throughout this volume.

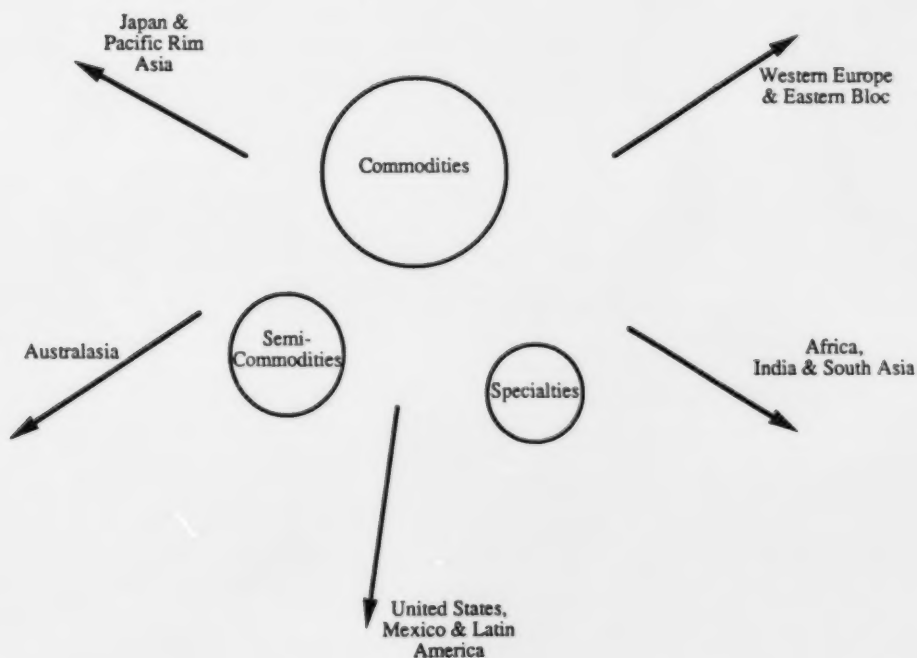
4.4 MARKET AND TRADE ISSUES

4.4.1 Canada's Export Role

One of the important conclusions of this study is that it is in Canada's interests to have free and unfettered access to all world markets, if its full potential and competitive strengths in forest product exports are to be maximized. The reasons for this have been discussed extensively elsewhere in this report and will not be repeated here. In summary, the concept is illustrated in Figure 4-27.

Figure 4-27

FOR CANADA'S FOREST SECTOR TO
REALIZE ITS GROWTH POTENTIAL IT IS
ESSENTIAL FOR IT TO HAVE FREE ACCESS
TO ALL INTERNATIONAL MARKETS



Access to world markets is essential for Canada's large volume commodity forest product grades. It is also essential for the semi-commodity grades and specialties which, as shown in Volume III, will expand in importance as markets develop and some could be large volume commodities within a few years.

There are a number of market and trade related constraints, however, which may preclude the achievement of Canada's export growth potential. These are discussed below.

4.4.2 Identifying and Exploiting Market Opportunities

In essence, there are a number of specific policy options in the areas shown below. The options identified are by no means definitive and are provided as a basis for discussion and further elaboration.

- * Market Access
- * Market Intelligence
- * Market Development

Market Access

Over a considerable number of years, Canada's forest sector has enjoyed the benefits of a world economy within which trade liberalization has been a major thrust. As the world's single largest exporter of forest products, by value, the decline of tariff levels globally and increasing freedom of trade have been beneficial to Canada. They have encouraged an increasing level of regional specialization based on comparative cost advantages. Also, they have assisted Canada's forest products exporting sector which, in general, is characterised by large scale, low unit cost production facilities which try to maintain high operating levels throughout successive market cycles.

These developments have been beneficial to exporters of Canada's major high volume, commodity forest product grades: namely, softwood lumber, newsprint and market pulp. Some of the smaller, higher value-added segments of the Canadian industry, including woodfree papers, some paperboards and converted wood and paper products, have evolved over time to serve a moderately protected but essentially very small domestic market. Nevertheless, the gradual evolution of freer world trade has enabled those sectors, in which Canada has longer term competitive potential, to grow. Also, some sectors in which Canada is less competitive have declined.

As we point out in Volume III of this study, Canada's recent expansions in woodfree printing papers (Great Lakes, Domtar and Prince Albert) represent a healthy development of forward integration from market kraft pulp making. Freer world trade has been beneficial to this sector.

We believe that there is an additional potential to exploit the expected worldwide growth in printing and publication papers, particularly if conventional definitions of woodfree and wood-containing grades are displaced by mixed chemical and mechanical pulp furnishes which produce papers engineered for specific end-uses. These developments favour Canada's resource and locational strengths and would benefit from free trade on a wide geographical basis.

It is relevant to note that Canada's future position vis-a-vis the large and growing US market may be better assured under the Canada-US Free Trade Agreement. Nevertheless, it would be to Canada's longer term benefit also to have free access to other major world markets, including the European Economic Community (EEC) and Japan as well as various other smaller volume offshore markets. Canada's position as a major, large-scale, low-unit cost producer and exporter to the US is akin to that of the Nordic countries vis-a-vis the European Community. While they will remain targeted on increasing export to the EEC, Nordic exporters clearly also have strong business development and export programs to other world market areas. In addition, these are supported by well developed programs of market intelligence and market development, as discussed below.

Producers in the US and Japan increasingly are striving to develop offshore markets in the grades of forest products in which they have competitive strengths. Japan has made excellent progress in export-substitution (as distinct from import-substitution). Under these policies, Japan allows increased imports of certain grades of forest products to serve the high standards of its domestic market. Correspondingly, it is able to maintain domestic capacity in lower qualities of these grades, for export to emerging Pacific Rim markets.

The Canada-US Free Trade, in our view, can have significant net benefits to Canada's forest products sector. Nevertheless, for the time dimension and global scope which are the parameters of this study, it is relevant to note that Canada's trade policy options should also emphasize the reduction of tariff and non-tariff barriers in the world market as a whole.

As an efficient and cost-competitive exporter, Canada has more to gain than most of the countries from fully liberalized world trade in forest products. Moreover, during the next twenty years or so, to the year 2010, this would enable Canada to continue along the path it already is on towards regional specialization and higher productivity in its most competitive forest products.

A number of selective tariffs still exist in some of Canada's major markets outside the US. Developments in the European Community, particularly focussing on the scheduled unification of trade policies in 1992, should receive high priority for Canada in trade discussions. Tariff and non-tariff barriers in the EEC may not seem to be overwhelmingly significant today, however, they affect grades in which Canada is very cost competitive and over the horizon of 20 years unduly restrict Canada's market potential.

Certainly they are of very real concern to eastern Canadian producers of newsprint and many grades of softwood lumber, as well as to western Canadian producers of high value-added softwood lumber grades (e.g. planed or dressed lumber). In addition, there are tariffs on non-quota plywood and reconstituted panelboards which are a disadvantage to both eastern and western Canadian producers.

Despite reductions over past years, tariffs and duty-free quotas still play a significant role in wood products trade. The Japanese tariff of 8% on S-P-F lumber is of particular significance but the 4% duty levied by the EEC on planed lumber represents a competitive disadvantage. Tariffs on specialty, further processed goods, vary widely by country but in most countries the level imposed increases in proportion to the degree of processing or value-added. Plywood and reconstituted boards, also, are negatively affected by tariffs on imports into the EEC (10% on non-quota volumes) and Japan (recently reduced but still at 10%).

In addition, non-tariff barriers appear to be increasingly significant. National building codes and product standards are important factors in international trade of wood products. These can vary from relatively innocuous, but still burdensome, restrictions on products with certain specifications. For example, in the US trade classification for some grades vary from those in Canada for the identical grade. Offshore producers have circumvented these non-tariff restrictions by minor re-classifications of grades on export documents. Customs procedures and some restrictive practices nevertheless can be very irksome for the bona fide exporter.

In addition to tariff and non-tariff barriers, there exists considerable scope to improve the flow of goods and services between provinces within Canada, and between Canadian provinces and individual states or regions in the US. Interpretation of custom regulations, rules over bonded goods and so on vary considerably between various border points. The amount of paperwork varies from place to place. Considerable latitude frequently is given to local officials to interpret regulations, classification of goods and so on. Moreover, these are not always consistent at the same place. In offshore markets, Canadian exporters frequently experience similar regulatory restrictions. Canadian consular officials often are able to assist, but many exporters in the forest products sector (particularly smaller companies) find these types of restrictions to be detrimental to their initiatives in export trade.

With regard to Canada's trade policy options over the next 20 years or so, the basic situation in our view is that free and fair trade is to Canada's benefit. Canada has the opportunity to pursue this objective in the current round of multi-lateral trade negotiations under the auspices of the General Agreement on Trade and Tariffs as well as through bi-lateral trade negotiations.

Market Intelligence

In the information age of the late 20th century, it is surprising that the flow of market intelligence to and from the Canadian forest products sector is not better than it appears to be, at times. Significant strides have been made, particularly in the service industries of the private sector. Nevertheless, in comparison with, for example, Nordic countries and Japan, Canada's market intelligence network, utilizing official trade channels, has considerable potential for enhancement.

Market Development

A wide variety of federal and provincial programs exists to assist the forest sector in its business development efforts in export markets. The Cooperative Overseas Market Development Program (COMDP) which involves the federal government, provincial industry and provincial government has achieved notable success in wood products exporting. In addition, Canadian trade missions have become increasingly imaginative and successful. Some programs, such as the PEMD system, help individual companies which seek to develop specific target markets. Canadian International Development Agency (CIDA), Export Development Corporation (EDC) and other programs are well established. Nevertheless, in view of the magnitude of Canadian forest products future export opportunities cited in this study, one of the policy issues requiring consideration is whether or not these programs can be strengthened to fully exploit identified potential.

4.5 THE FIBRE CONSTRAINT: AN ALTERNATIVE PERSPECTIVE

4.5.1 Timber Supply

There is a widespread contention that Canada is running out of wood. This is perhaps the single most important issue which needs to be reconciled if a significant improvement in Canada's investment climate for forest products is to be achieved. It is yet another chicken and egg situation and the danger is that it can have the opposite effect to the one intended.

As noted in Volume V, this study is based on certain assumptions about Canada's timber supply. The data utilized to make the allowable annual cut assessments are those provided by the provinces. They indicate that Canada is approaching its current economically operable supply limits as defined by existing AAC policies. As we stated earlier, it is prudent to acknowledge these supply limits. Correspondingly, in our analysis of forest products growth in Canada (Volumes III and IV), we based our projections on these data. Even though we take account of the probable trend in the industry's technological response to fibre constraints (e.g. switch to higher yielding from lower yielding pulps), our projections result in a fibre constrained scenario, based on these data.

The overall conclusion of our Volume V analysis is that the demand for softwood fibre in Canada is approaching current economically operable supply limits as defined by the allowable annual cuts (AAC) determined by the provinces. It is apparent, however, that there are regional softwood surpluses and hardwoods are vastly underutilized throughout Canada.

Taken at face value, the data indicate that BC has little fibre left anywhere except for modest hardwood tracts in the Interior. The AAC data in BC is oriented toward lumber quality timber, however, and does not include some reasonable quantities of pulp-compatible softwood timber in both the Coastal and Interior regions. Therefore, while there is little surplus of fibre for lumber, there is room for some growth in pulp and paper, using either softwood and/or hardwood.

The species mix on the Coast is peculiar within Canada, consisting of significant portions of cedar, hemlock and Douglas fir and lends itself to more specialty type solid wood products. The hardwood in the Interior is largely aspen which is good for use in either BHKP or CTMP.

Quebec is consuming beyond its current AAC in softwood (although local surplus still exist) but still has significant unused hardwood. Ontario on the other hand appears to have a surplus of both softwood and hardwood. The apparent softwood surplus may be exaggerated, however, due to a lack of comprehensive inventory data. If, after further analysis, it is determined that it does exist, it could support industry growth based on softwood. The combined situation in Ontario and Quebec leads to a possible scenario in which Quebec would become less important for the heavily softwood dependent industries (e.g. newsprint and lumber). Instead, Quebec could place future emphasis on hardwood and mixed species products (e.g. printing/writing papers and BHKP). The hardwood surplus in Quebec is a mixture of high and low density, the former being used in products like BHKP and specialty solid wood products. Correspondingly, additional growth in softwood based industries could occur in Ontario.

As noted previously this scenario of industry structural change between Ontario and Quebec based on fibre constraints in Quebec faces some formidable hurdles in terms of practical implementation, not least because of the uncertainty over inventory data in Ontario.

The data for the Atlantic region indicate that it has little incremental softwood left but again some high density hardwood exists, albeit modest in absolute terms. This surplus could, however, support some growth in BHKP.

The Prairies enjoy a healthy surplus of fibre in both softwoods and hardwoods and this provides the greatest potential for growth from the perspective of fibre availability. Most of the surplus is in Alberta and much currently lacks infrastructure. The northern region is remote from many market areas and development costs will be high. Nevertheless, the Government of Alberta is very active in planning to develop this timber and infrastructure. The tree size and species mix will favour pulp and paper development over lumber. The surplus in the Prairies should be kept in perspective, however. While one half to two thirds of Canada's softwood surplus (depending on how it is counted) is in the Prairies, only one quarter of Canada's hardwood surplus is in this region. In absolute terms the hardwood surplus in the Prairies is roughly equal to that in Ontario or Quebec.

It is beyond the scope of this study to comment in any detail on these data. The following observations are offered, however, from the perspective of analyzing Canada's constraint to growth and identifying factors which could lead to an improvement in its investment climate.

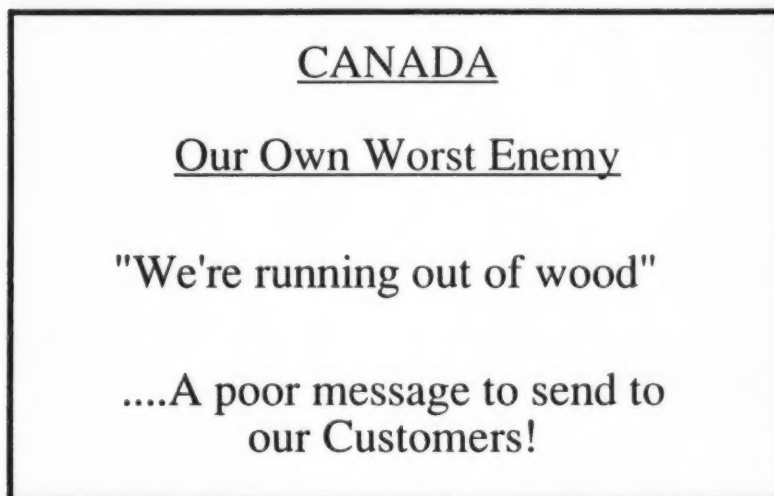
Canada and Sweden Compared

Fibre shortages can be defined in terms of supply limitations at a given price level or a given level of technology, such as harvesting or converting yield. Correspondingly, the price elasticity of timber supply (or the response of new supply to a price rise) often means that operations will log more marginal stands, or utilize alternative species, where scope exists for this to occur.

Clearly, there are specific areas of Canada where there is very limited scope of any kind for supply increase, regardless of price level. There may, however, be an answer in the process technology response of these areas. In most other areas of Canada, there appears to be scope for incremental supply, albeit at a higher, and possibly unacceptable, cost to industry based on prevailing technologies.

From the perspective of creating an attractive investment climate, however, the message that "Canada is running out of wood" is a poor message to send to our customers (Figure 4-28). It implies a decline in Canada's manufacturing capacity which simply is not true.

Figure 4-28



Nevertheless, increasing fibre constraints clearly require consideration of alternative technologies. This has been occurring in Canada for some time. Moreover, experience elsewhere suggests that industry's adaptive response to fibre constraints can be quite innovative and need not necessarily constrain growth if the right conditions are present. There can be, however, a significant cost involved in the transition from a relatively low cost fibre and extensive utilization environment to one of higher costs and intensive utilization. These costs are discussed in Volume VI.

Sweden already has experienced this type of transition and has already built an international reputation as a first class supplier and technological leader in many grades of wood products, pulp, paper and paperboard. In the 1960s and subsequently, there was a similar prediction that Sweden would run out of wood (Figure 4-29). In fact, Sweden has significantly more pulp and papermaking capacity today than it had fifteen years ago (Table 4-1).

Figure 4-29

Canada & Sweden Compared

Sweden: 1960's Prediction

"Running Out of Wood"

- It didn't happen!

- Significantly more pulp and papermaking capacity now than 15 years ago
- Better utilization (forests and conversion) and more intensive forest management
- Although wood costs are considerably higher than those in North America

Table 4-1
Swedish Annual Production Capacity

	1960	1970	1980	1985
Pulp (thousand tonnes)	5,570	8,900	10,540	9,960
Paper (thousand tonnes)	2,380	4,770	7,220	7,670
Paper as a % of Pulp	42	54	68	77

Lumber (million m ³)	6,500	12,006	11,077	11,275

Source: SCPF, WRA & Trade Press

It has achieved a high degree of modernization and subsequent integration of pulp with papermaking capacity. Moreover, as already noted in this volume, Sweden's wood costs are very high by Canadian and global standards. Finland also is in the same position and its response has been similar to that of Sweden, particularly in its very successful development of mechanical pulp based printing papers (SC, filled sheets etc.)

The circumstances and policies which facilitated these changes are unlikely to be replicated in Canada. Moreover, the national goals, timberland tenure system, business culture and level of integration with equipment suppliers and so on is very different from the situation in Canada. Nevertheless, it is indicative of a positive and successful response to an apparent lack of fibre for future expansion.

4.5.2 Provincial Policy Options Towards Sector Development

Another important factor influencing the level of investment, and the structure, of the sector is the role played by provincial governments. Provincial policies towards sector development, together with provincial and federal government programs, are crucial to the pace and form of development.

The Canadian forest sector has a long history of public sector involvement, by virtue of the sector's dependence on timber resources on public lands. Moreover, the policies and programs which have evolved have had a major influence on Canada's successful growth as one of the world's major forest products exporters.

In our view, a significant proportion of the credit for successful utilization of Canada's forest resources historically can be attributed to very well considered provincial government policies. In almost all instances, these policies and programs have evolved steadily and consistently towards the goal of improved utilization and the achievement of a higher value-added product mix. These policies, of necessity, also have to be pragmatic, to accommodate short run adverse market conditions, in an industry dependent on commodity price cycles. In this respect too, provincial policies and programs have been supportive of the longer term, steady development of a healthy manufacturing sector.

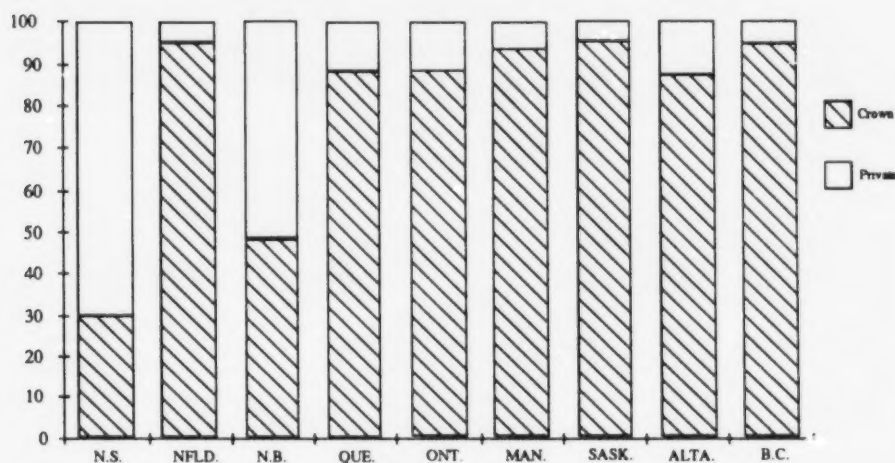
Nevertheless, as Canada has moved from a position of having extensive un-utilised timber reserves to its current situation of increasing constraints on regional supply (see Volume V), provincial governments have been forced to deal with a much wider range of resource issues, environmental pressures, competing land uses, economic and trade issues. The role of the federal government shifted also, in this regard.

The basic thesis we present in this discussion is that government's traditional role in relation to natural resources has been shifting for some time. In view of the tremendous additional pressures that are likely to occur as Canada reaches out to achieve its growth opportunities to the year 2010, we suggest that a potential constraint could be that provincial policies simply will not, or may not be able to, respond quickly enough, or appropriately enough to the challenge. We suggest that the main cause of this will be that, in many cases, the provinces are more comfortable with a passive reactive role to sector development than they are with the more aggressive role of exploiting their partnership to facilitate private sector development.

A quick look at the ownership structure of Canada's timber resources (Figure 4-30) shows that each of the provinces of Canada without doubt is in the forest products business in a big way. The bulk of Canada's forest is publicly owned. Management, harvesting and other aspects of use, regeneration, pricing and so on are under provincial jurisdiction. The traditional roles of the province in this regard can be summarized as follows:

Management:	the stewardship responsibilities of the province over the forests and forest land, involving land use, harvesting, restocking, stand tending, and protection. With the exception of land use, these responsibilities may be allocated to the tenure holder(s).
Tenure:	the types of contractual agreement between the provinces (owners) and the users (tenure holder), defining the specifics of the contract, rights and responsibilities.
Allocation:	the overall policy decided by the province as to what rights should be conferred and to whom.
Pricing:	a method for obtaining public revenue from resource use and for achieving other socio-economic goals.

Figure 4-30
Crown vs Private Forest Land in Canada
 (percentage)



Source: Provincial government data

Forest land and resource management planning is carried out by all provinces through their forest ministries. Based upon resource inventories, forest lands are organized into management units according to the physical characteristics of the forests, land ownership patterns, infrastructure, the economics of timber supply, other resource values and the nature of existing or potential forest industries. Area specific management plans which include allowable annual cut calculations are drawn up for each management unit. These plans define land use priorities and exploitable timber supplies and stipulate forest development practices, utilization standards, forest protection programs, silvicultural prescriptions and resultant permissible rates of cutting. Forest management responsibilities may be retained by the forest ministries or they may be allocated in whole or in part to tenure holders. Where management responsibilities are allocated to users, the forest ministry retains the right to set standards, approve programs and audit results. Forest management costs are generally shared between the resource owner and the user according to agreed formulae which vary from province to province.

Most of Canada's forest lands is now controlled under some form of multiple-use management and the demonstrated needs of many users must be reconciled through the allocation process. Allocation refers to the system where by the forest land owner confers user rights to specified resources (e.g. timber, wildlife, recreation, minerals, petroleum, water, etc.) to particular users or user groups. Since by definition forest land is land which has its highest and best use in the perpetual production of timber crops, the forest industry is the principal user group. The allocation of rights to timber is generally based upon socio-economic priorities set by governments (the resource owner) and given form in volume or area-volume tenure agreements which may specify the use to which the timber is to be put.

Tenures to public forest land vary within each province, as well as between the provinces. The systems currently in place have evolved, over a long period of years, as a consequence of the nature of the resource and the need to achieve provincial economic growth, efficiency and social goals. Essentially, they are based on a practical response which has been reviewed and frequently amended in order to improve utilization, regeneration of timber and the use of public forest lands.

Timber pricing systems or per unit volume stumpage charges are the sole prerogative of the provinces as land owners and as such, they reflect the socio-economic objectives of individual jurisdictions. The only observable commonality between provinces is the effort to balance public sector revenues and expenditures, excluding the cost of protecting non-forest values. Stumpage prices may vary according to the timbers' perceived value in use (i.e. log quality, size and/or species mix) and cost/price relationships or they may be flat rates based upon arbitrary objectives. In some jurisdictions, stumpage charges may be fixed rates for extended time periods, whilst in others, they may change radically from one year to the next. Uncertainty concerning future stumpage costs can act as a considerable disincentive to forest industry investment.

The ways in which provinces perform their stewardship roles obviously have a very influential effect on the structure of the industry. Indeed, provincial policies are a major determining factor which can facilitate or deter investment. Consequently, it is pertinent to recognize a fifth role of provinces, in this regard, which is their power to determine the industrial structure for the sector which is deemed appropriate and desirable for the province (Figure 4-31).

Figure 4-31

Provincial policies will be an increasingly powerful tool in determining new investment in the forest sector, and the industrial structure which is appropriate and desirable for the Province.

The past and current performance of the various provinces in these roles has varied over time within each province, and between the provinces. In general, they are highly competent in their management of the resource when it comes to stewardship functions of the timber resource. Thus, for example, forest ministries develop very practical policies for fire protection, harvesting of insect-attacked timber, and utilization of timber adversely affected by other natural forces. Typically, there are a few, but normally reconcilable, differences of opinion between ministries and the tenure-holder over the areas affected by these natural phenomena and the appropriate programs to overcome the problems. Changes in the ground rules regarding tenure clearly raise questions of a different magnitude.

In all cases, provinces have begun (in the last decade) to take intensive forest management programs much more seriously. Annual replantings have increased significantly since the mid 1970s. Today, they are achieving a high degree of success. So, in this regard, province's influence over, and investment in, the sector is increasing. Even so, these types of programs frequently are regarded by provinces as a stewardship function, as distinct from active planning with industry about issues such as optimum species to replant or regenerate, or the desirability of sawlog vs pulp log regimes and so on.

When it comes to policies which influence the structure of the industry, however, provinces typically tend to move slowly and carefully. There have been a number of exceptions to this, particularly when economic, social and political goals shift. Most provinces typically have been consultative and extensive discussions have taken place in the past between the various partners in the sector: government, management and labour.

Moreover, particularly since the early 1970s, governments have introduced various programs for industrial development designed to help create jobs, assist forest industry diversification, assist companies expand their product-markets and help develop new products through R&D programs.

Some of the provinces also have taken a more direct role, from time to time, in ensuring that the right type of investment occurs. Examples of incentive programs, and sometimes direct financial participation, are well known. They occur in many other countries and, as pointed out elsewhere in this study, frequently they are crucial to attaining a successful investment. Many of these programs, while often necessary to bring in an investor, are one-time activities as distinct from longer term programs of sustained development. Typically, they assist companies over the initial capital spending hump where the company otherwise may have to undertake private spending on social or infra-structural facilities, where public benefits would accrue, or where provinces want to attract the investment for other reasons.

Provinces have taken steps to ensure that their basic goals are communicated publicly. BC's "Forest and Range Resource Analyses" of 1980/84 and Quebec's recent "Building a Forest for Tomorrow, the Forest Policy" are good examples. The longer term thrust of provincial governments' policies and program clearly indicates a desire to move to better utilization of the resource. In most cases, this is expressed in terms of achieving the most appropriate higher value added industrial structure of the sector within the province.

While these types of policies and programs may have served the industry reasonably well in the past, they may not be sufficient to ensure that the potential of the future will be achieved. In Canada, there are strong arguments against and, in most cases, an aversion today, to any direct involvement in the form of ownership of manufacturing capacity. Moreover, with a few exceptions, the overwhelming preference recently has been towards privatization of former Crown corporations and provincial holdings in manufacturing. Direct involvement by the provinces, in this regard, appears to be easily discounted.

Nevertheless, there may be other, indirect, roles which the provinces could perform in order to encourage investment. Earlier in this section, we pointed out that very large new capital injections are required in the forest products sector. Moreover, the incremental investment frequently soon overtakes the initial capital investment. As the various regions of Canada move towards a higher value-added product-mix, the incremental capital requirements will become larger and larger. Moreover, there will be increases in real dollar terms, due to the increased capital intensity per unit of output and rising levels of technological sophistication.

As discussed elsewhere in this study, the broader issue is that in many parts of Canada the investment climate often is not as favourable as it is in competing areas. As a result, re-investment by existing companies frequently is lower than would be justified by Canada's superior resource position and its market potential. Over the next twenty years, the opportunity exists for the provinces and territories to take a much more hands-on approach in developing programs for longer term sustained re-investment in Canada's primary forest product base, and in sustained levels of intensive forest management, in order to help provide a much better climate for value-added investment. These programs could range from the conventional to the truly creative.



GLOSSARY OF TERMS

AAC	Annual Allowable Cut
ADMT	Air dry metric ton
Affiliated Pulp	In-house transactions of captive pulp
API	American Paper Institute
Aseptic packaging	Sterilized packaging
BCTMP	Bleached chemi-thermomechanical pulp
BDMT	Bone dry metric ton
BHKP	Bleached hardwood kraft pulp
BKP	Bleached kraft pulp
Boxboard	Relatively thick solid paperboard used in folding box manufacture.
Bristol Board	A good quality type of cardboard commonly made on a fourdrinier or cylinder machine
BSKP	Bleached softwood kraft pulp
Building Papers	Types of paper produced from strong fibre stocks, such as kraft, processed and treated for use in the building trade as sheathing, roofing and vapour barriers
Capex	Capital expenditure/investment
Captive pulp	Not available for the open market.
CDX	A US grade of plywood for exterior application employing 'C' and 'D' grade face veneers
Chemical Pulp	The mass of fibres resulting from the reduction of wood or other fibrous raw material into its component parts during the cooking phases with various chemical liquors, in such processes as sulphate, sulphite, soda, NSSC, etc.
Chips	Pieces of wood (approximately 1 inch square and 1/8 inch thick) resulting from the cutting of pulpwood logs

CMP	Chemi-mechanical pulp
Coated Paper	A term applied to any type of paper whose surface has been treated in such a way as to apply a coating in order to enhance its finish characteristics
COFI	Council of Forest Industries of BC
Commodity grade	A standard grading of lumber widely traded and appropriate for use in many applications
Containerboard	Any type of single and multi-ply solid and corrugated boards used to make up boxes and other containers for shipping materials, and the type of paperboard used to make them up
Construction grade	A visual grading of lumber appropriate for load-bearing applications especially in residential shelter
Corrugated medium	Corrugated material that is sandwiched between exterior layers of linerboard.
CPPA	Canadian Pulp and Paper Association
CTMP	Chemi-thermomechanical pulp
ECE	Economic Commission for Europe (US)
Economy of scale	Economically sized mill, achieving the lowest average cost per unit of production in relation to discrete major items of capital equipment.
EEC	European Economic Community
EFTA	European Free Trade Association
ETTS IV	European Timber Trends, Fourth Report, ECE
FAO	Food and Agricultural Organization of the United Nations
fbm	Foot board measure, equal to a lumber volume of 1/12 of a cubic foot (Mfbm is a thousand fbm and MMfbm is million fbm)
Fibre	An elongated, tapering, thick-walled cellular unit which is the structural component of woody plants

Filler	A substance added to the pulp stock to fill the spaces between fibres and enhance the printing properties of the paper made from it
Freesheet	Paper containing less than 10% mechanical pulp, usually 0%; commonly referred to as woodfree in Western Europe.
Furnish	The various components, comprising pulps, additives, fillers and extenders, used in papermaking.
GATT	General Agreement on Trade and Tariffs.
Greenfield	A new mill including all facilities and costs.
Groundwood	Mechanical pulp usually produced on stone grinders. Often used as a general term for all mechanically produced pulps.
Hardwood	Wood from non-coniferous trees
HAS	H.A. Simons Ltd.
Iberian Peninsula	Spain and Portugal
Integrated paper mill	A mill with pulping facilities connected to a paper machine.
Integrated Pulp	The pulp is manufactured on site and passed to an adjacent paper machine
kerf	The actual width of the saw cut
Kiln dried	Wood dried in a kiln with the use of an external heat source
Kraft (pulp)	Means "strength" in German; the term commonly used as a name for sulphate chemical pulp
Linerboard	Unbleached kraft paperboard manufactured for use as facing material when combining paperboard for conversion into corrugated or solid fibre boxes
Liquid packaging (LPB)	Boxboard used in the packaging of liquid
LVL	Laminated veneer lumber - a structural lumber product made from sheets of veneer all with their grain oriented longitudinally, bonded together

LWC	Lightweight coated paper (less than 60 g/m ²)
Market pulp	Any pulp manufactured by a pulp mill and sold on the open market as a product
MDF	Medium density fibreboard - a dry formed panel product made from sheets from wood flakes combined with synthetic resin and compressed under heat
Mechanical Paper	General reference to a variety of medium weight papers made primarily from pulp produced by a mechanical pulping process
Mechanical Pulp	Fine textured, usually bright pulps used in paper and paperboard manufacture and produced by mechanical rather than chemical processes
MSR	Machine stress rated - lumber that has been non-destructively tested to indicate its strength values such as modules of elasticity
MWC	Medium weight (60-90 g/m ²) coated paper containing mechanical pulp
MWh	Megawatt hour
Non-integrated	Pulp produced on a location separate from the paper mill.
Non-wovens	A sheet of cloth-like material made from long natural and synthetic fibres
Nordic Countries	Norway, Sweden, Finland
Norscan	Canada, USA, Sweden, Finland, Norway
OSB	Orientated strand board
Panelboard	A dense, heavy stiff paperboard used in making suitcases, and in building construction and manufacturing
Parallam	A structural lumber product made with aligned wood strands (pieces of veneer) bonded with waterproof resin
Particleboard	A panel product made from milled wood particles combined and bonded with resin under controlled heat and pressure
PB	Paperboard

PGW	Pressurized groundwood pulping process
Pigmentized	Containing mineral additives to enhance paper characteristics
P&W	Printing & writing grades
RISI	Resource Information Systems, Inc.
Reconstituted Board	A panel product made by bonding and pressing veneer, flakes, wafers or particle of wood
RMP	Refiner mechanical pulp
Sack Kraft	A kraft paper with good stretch, high tensile energy absorption and high tear resistance
SC, A/B	Supercalendered paper, A and B grades
Sheathing	Various sizes and thicknesses of structural and insulating fibreboard used in building construction
Softwood	Wood from coniferous trees
SPCF	Swedish Pulp and Paper Association
Specialties	Papers and paperboard not considered one of the standards by the paper industry
S-P-F	Spruce-Pine-Fir - a commercial designation of a combination of species comprising white spruce, engelmann spruce, black spruce, red spruce, lodgepole pine, jack pine, alpine fir and balsam fir
Stone Groundwood	Pulp made by abrading wood logs against a revolving stone, usually at atmospheric pressure but sometimes done under pressurized conditions
Stumpage	The fee paid by tenure holders for timber cut on Crown lands
Supercalendered Paper	Paper whose surface finish has a higher-than-normal glaze obtained by passing it between a series of alternating arranged metal and cotton or paper-covered rolls under pressure on a paper process machine called a supercalender
TMP	Thermomechanical pulp

tpd	tonnes per day
tpy	tonnes per year
Uncoated Freesheet	Grades of paper made up of essentially all chemical pulp with no mechanical pulp and without any applied sheet coating material
Value-added	Incremental increase in net value due to a process step
Waferboard	A panel product made from milled dried wood flakes combined with a synthetic adhesive and formed into a flat panel under controlled heat and pressure
Wood-containing	Paper containing more than 10% mechanical pulp
Woodfree (paper)	Paper containing less than 10% mechanical pulp, usually 0%
WRA	Woodbridge, Reed and Associates